User's Manual

R-STUDIO

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I Introduction to R-Studio

R-Studio is a family of powerful and cost-effective undelete and data recovery software. Empowered by new unique data recovery technologies, it is the most comprehensive data recovery solution for recovering files from from Ext2/3/4FS (Linux), FAT12/16/32, exFAT, NTFS, NTFS5 (created or updated by Windows 2000/XP/2003/Vista/2008/7), HFS/HFS+ (Macintosh), Little and Big Endian variants of UFS1/UFS2 (FreeBSD/OpenBSD/NetBSD/Solaris) partitions. It functions on local and network disks, even if such partitions are formatted, damaged or deleted. Flexible parameter settings give you absolute control over the data recovery.

R-Studio Features
System Requirements
Contact Information and Technical Support
Data Recovery Using R-Studio
Basic File Recovery
Advanced Data Recovery
Mass File Recovery
Volume Sets and RAIDs
Data Recovery over Network
Text/hexadecimal editor
Technical Information and Troubleshooting
Working with the Third-Party Hardware
R-Studio Emergency
R-Studio Agent Emergency

1.1 R-Studio Features

R-Studio is a family of file restoring utilities. It recovers files both on local disks and on disks on remote computers over network, even if their partition structures are damaged. A unique ***IntelligentScan*** technology and flexible parameter settings give you real control over the fastest data recovery ever seen.

R-Studio features:

- Host OS: Linux, kernel 2.6 and above.
- Remotely recovers data over network. Data can be recovered on network computers running Win9x, ME, NT, 2000, XP, or Linux and some other UNIX OS.
- Supported file systems: Ext2/3/4FS (created by Linux or other OS), FAT12, FAT16, FAT32, NTFS, NTFS5 (created and updated by Windows 2000/XP/2003/Vista/7), exFAT, , HFS, HFS+, HFSX, and UFS1, UFS2, UFS BigEndian (used by the FreeBSD, OpenBSD, and NetBSD operating systems).
  Please note, that when a file is being deleted on the HFS, HFS+, HFSX file systems, the computer completely removes all system information on it, and there is no way to recover the deleted file except by using the **Extra Search for Known File Types** option. Nevertheless, **R-Studio** is able to read existing files from HFS, HFS+, and HFSX disks.
- Support for known file types. **R-Studio** searches for files with known typical features of their structures allowing the user to search for files on devices with unknown files systems, including an HD, CD, DVD, floppy disk, Compact Flash Card, USB drive, ZIP drive, Memory Sticks, and other removable media.
- Scan process visualization. While scanning an object, **R-Studio** graphically shows items that have been found, including files of known types, FAT and NTFS MFT records, boot records, etc.

- Mass file recovery support.
- Support for file recovery lists - lists of files that can be exported from **R-Studio**, manually edited, and then loaded back. Files from such lists will be automatically marked for recovery.
- Dynamic disk support.
- Software RAID, volume set, and stripe set support. Support for RAID 6, RAID 5, and RAID 4 layouts. Support for custom RAID layouts. Parameters like block size and order, offsets, and even the number of stripe blocks can be explicitly specified. Custom RAID configurations can be saved.
- Support for Windows Storage Spaces, created by Windows 8/8.1 and Windows 10.
- Support for software Apple software RAIDs
- Support for Linux LVM/LVM2
- RAID consistency check (check for valid data parity values).
- Hardware RAID, volume set, and stripe set support.
- Automatic RAID parameter recognition.
- Reverse RAIDs: A technique that decomposes real disk objects into virtual RAIDs. Then those components of reverse RAID scan be processed like real objects. They can be viewed, edited, imaged, copied to physical drives, etc. This technique also can re-construct data on the real parents of a virtual RAID. For example, it becomes possible to re-construct data on a missing disk.
- Creates image files for an entire hard drive, logical disk, or its part. Such image files can be processed like regular disks. Images can be either simple exact object copies (Plain images) compatible with the previous versions of **R-Studio**, or compressed images that can be compressed, split into several parts, and password-protected. Such images are fully compatible with the images created by **R-Drive Image**, but incompatible with the previous versions of **R-Studio**. Images may be saved either on the local or remote computer. **R-Studio** can scan objects while creating their images.
- Advanced object copy. In addition to byte to byte copy of any object visible in the Drives panel, smart copy of partitions and hard drives is available.
- Recovers files on damaged or deleted partitions.
- Recovers compressed files (NTFS, NTFS5).
- Recovers encrypted files (NTFS5).
- Recovers alternative data streams (NTFS, NTFS5).
- Recognizes localized names.
- Recovered files can be saved on any (including network) disks visible to the host operating system.
- A hexadecimal disk and file editor supporting NTFS file non-resident attribute editing.
- Patterns (or templates) in the hexadecimal editor allowing for parsing the data according to specific data structure. Such patterns may be custom-created.
- File preview. Most of the file types can be previewed to estimate recovery chances.
- Enhanced remote host scanning procedure. In the new **R-Studio** network versions, data are analyzed on the remote host rather than on the home host, thereby the speed of recovery procedure greatly increases.
- Recovered files may be saved on a disk on a connected remote computer rather than be transferred over network to the local one. Saving recovered files on a remote computer may be useful when the remote computer has a healthy disk because you do not have to transfer files over network. It may be an external USB hard drive, for example.
- Forensic mode. (For the Technician version only).
- Support for S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) attribute monitoring.

- Support for third-party hardware. (For the Technician version only).
- **R-Studio Emergency***. The **R-Studio Emergency** version starts from a floppy or compact disk when it is necessary to recover data on a computer, on which OS cannot start up because its system files are corrupted or deleted.

*The **R-Studio Emergency** is a part of the **R-Studio** software package. When you buy an **R-Studio** single license you may run the **R-Studio Emergency** or/and install the **R-Studio** Windows version on one PC only and you may not transfer the licensed software to another PC.

R-Studio recovers files:

- That have been removed without the **Recycle Bin**, or when the **Recycle Bin** has been emptied;
- Removed by virus attack or power failure;
- After the partition with the files was reformatted, even for a different file system;
- When the partition structure on a hard drive was changed or damaged. In this case, **R-Studio** can scan the drive trying to find previously existed partitions and recover files from found partitions.
- From disks with bad sectors. In this case, **R-Studio** can first copy the entire disk or its part into an image file and then process such image file.

R-Studio can create image files for an entire hard drive, logical disk, or its part. Such image files can be processed like regular disks. Images are very useful if there is a risk of total data loss due to hardware malfunction. If bad blocks are constantly appearing on a hard drive, the only way to save the data is to immediately create an image of that drive. All data search, scan and recovery can be done from this image.

To learn more about the ***IntelligentScan*** technology, go to the **IntelligentScan** topic .

1.2 System Requirements

- An Intel-compatible x86 or 64-bit platform with 32 MB RAM, a mouse, and enough disk space for recovered files, image files, etc.
- Linux: Fedora 12+, Ubuntu/Kubuntu 10.4+ , Debian 4.0+ or any kernel 2.6+ Linux distribution capable of installing .rpm or .deb packages.
- Any Window manager.
- X.Org X server 1.7.6+ installed.
- Root privileges to install and run the program.
- A network connection for data recovering over network.

1.3 Contact Information and Technical Support

To obtain the latest version of **R-Studio**, go to:

Product Site: http://www.r-tt.com
Sales Department: sales@r-tt.com

R-Studio Technical Support Team is available 24 hours a day, seven days a week, and has an average response time less than 4 hours.

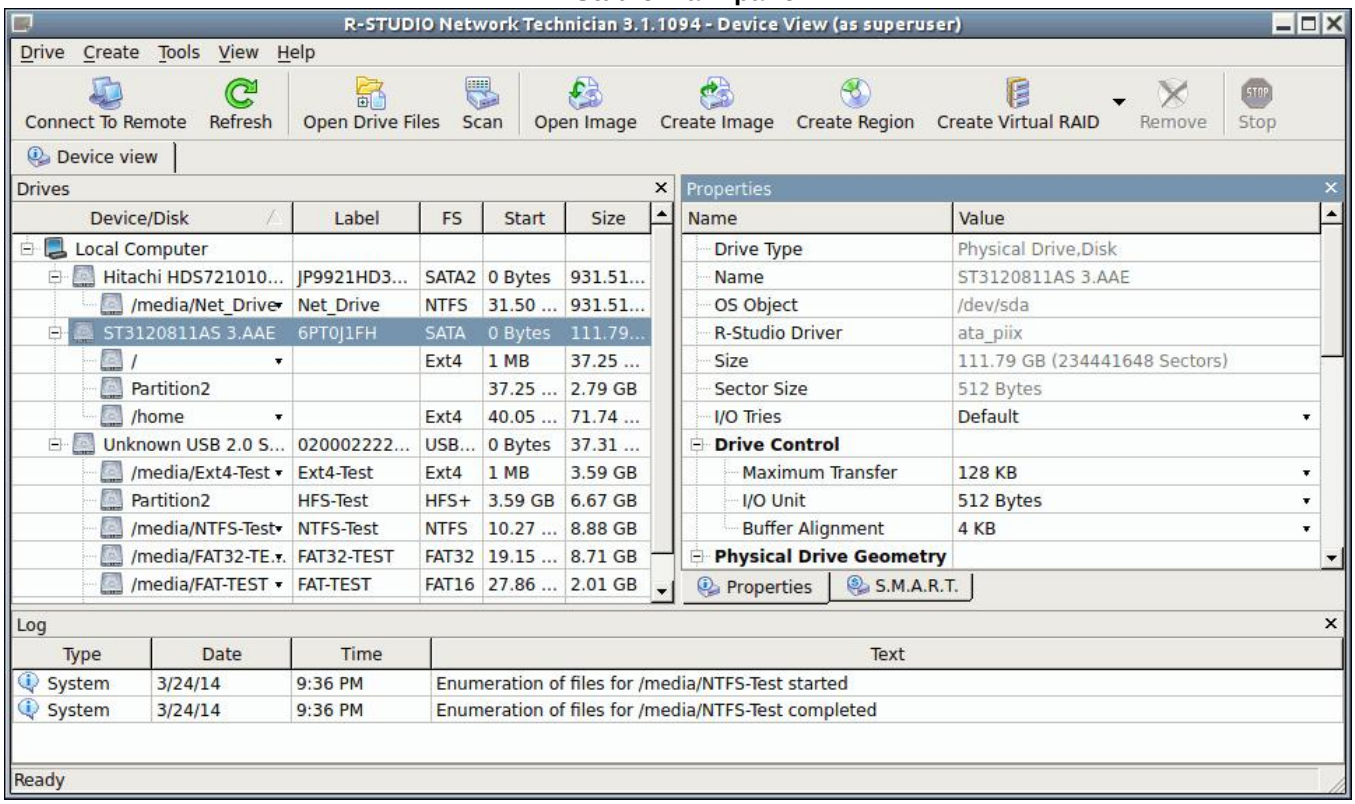
Tech. Support: support@r-tt.com
Send your support request to: http://www.r-tt.com/SupportRequest.shtml

File Recovery FAQ: http://www.r-tt.com/File_Recovery_FAQ.shtml
R-tt Forum: http://forum.r-tt.com

1.4 R-Studio Main Panel

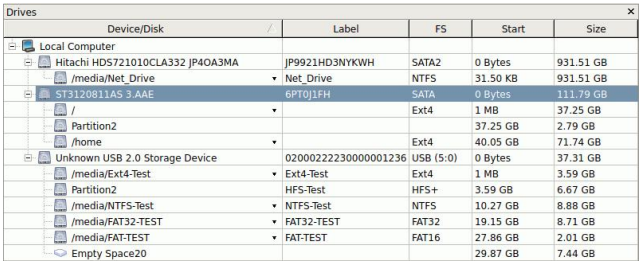
When **R-Studio** starts, its main panel appears on the desktop.

R-Studio Main panel



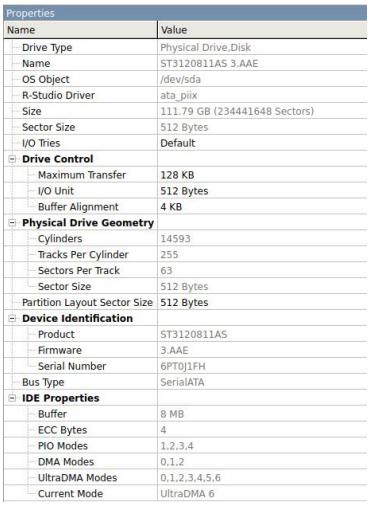
Drives panel:

You can select an object by clicking on it.



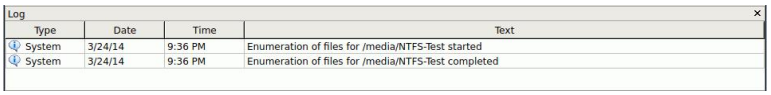
Properties tab:

This tab shows the properties of an object selected on the Drives panel.
Depending on the selected object, information on this Properties tab may vary.



The Properties tab names and values are described in detail on the Properties tab topic.

Log panel

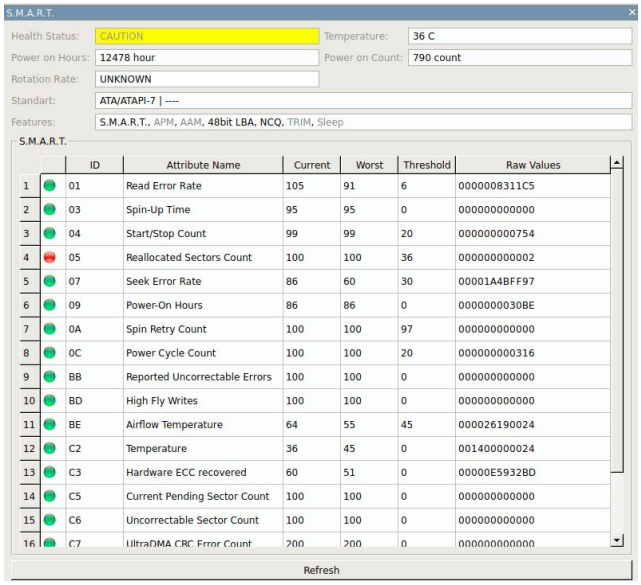


S.M.A.R.T. Info for a Hard Drive

When a hard drive is selected on the **R-Studio** main panel, an additional S.M.A.R.T. tab will appear. You may view the hardware conditions of the drive.

S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) is a technology widely-used in hard drives and solid-state devices that monitors their reliability conditions to predict possible hardware failures.

S.M.A.R.T. panel


S.M.A.R.T.
Health Status:
CAUTION
Temperature:
36 C
Power on Hours:
12478 hour
Power on Count:
790 count
Rotation Rate:
UNKNOWN
Standart:
ATA/ATAPI-7 | ----
Features:
S.M.A.R.T., APM, AAM, 48bit LBA, NCQ, TRIM, Sleep
S.M.A.R.T.
ID
Attribute Name
Current
Worst
Threshold
Raw Values
1 01 Read Error Rate 105 91 6 0000008311C5
2 03 Spin-Up Time 95 95 0 000000000000
3 04 Start/Stop Count 99 99 20 000000000754
4 05 Reallocated Sectors Count 100 100 36 000000000002
5 07 Seek Error Rate 86 60 30 00001A4BFF97
6 09 Power-On Hours 86 86 0 0000000030BE
7 0A Spin Retry Count 100 100 97 000000000000
8 0C Power Cycle Count 100 100 20 000000000316
9 BB Reported Uncorrectable Errors 100 100 0 000000000000
10 BD High Fly Writes 100 100 0 000000000000
11 BE Airflow Temperature 64 55 45 000026190024
12 C2 Temperature 36 45 0 001400000024
13 C3 Hardware ECC recovered 60 51 0 00000E5932BD
14 C5 Current Pending Sector Count 100 100 0 000000000000
15 C6 Uncorrectable Sector Count 100 100 0 000000000000
16 C7 UltraDMA CRC Error Count 200 200 0 000000000000
Refresh

Changing the program language

You may select the language of **R-Studio** main panel. To do so, select an available language on **Change Language** on the **Help** menu.

Panel view options

You may set which panels and bars to enable/disable.

To enable/disable:

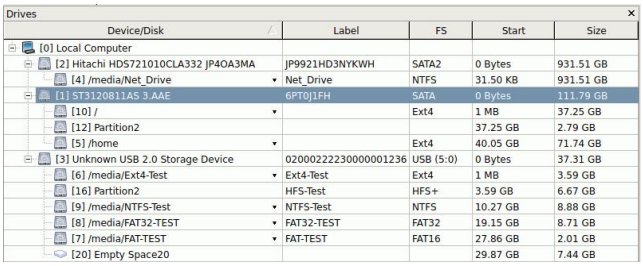
Toolbar	Select/clear **Toolbar** on the **View** menu
Status bar	Select/clear **Status bar** on the **View** menu
Drive pane	Select/clear **Device View** on the **View** menu
Properties pane	Select/clear **Properties View** on the **View** menu
Log panel	Select/clear **Event Log** on the **View** menu
If you have several tabs in the right pane, you may easily switch to any of the tab by selecting on the **View** menu	
Properties Tab	to view the Properties tab
Scan Information Tab	to view the Scan Information Tab tab
Parents Tab	to view the Parents tab
Properties	Select data types in which the data will be represented

You may select the units in which object's start and size are displayed.

Sometimes, there may be a lot of similar objects on the Drives panel. Those may be components of a RAID, for example. You may turn numerical indexes for such objects to distinguish them better. Those indexes will appear before the object names on the Drives panel.

To turn the numerical indexes on/of, go to the **Device** item on the **View** menu, and select/clear:

Show Physical Drives Indexes to display the indexes only for hard drives
Show All Objects Indexes to display the indexes for all objects on the Drives panel



To select the units

1 **Select Devices on the View menu**

2 **Select the units in which you want to see object sizes.**

You may select

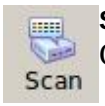
Show as Bytes
Show as Sectors
Show as Bytes and Sectors

Depending on the task **R-Studio** performs, its panel may vary. Those panels are described in appropriate topics. The Properties tab names and values are described in detail on the **Properties tab** topic.

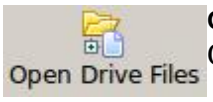
The general settings can be set on the Settings dialog box.

Connect to Remote
Click this button to connect to a remote computer on a network.

Refresh
Click this button to refresh the panels.



Scan
Click this button to start scanning a selected object.

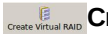


Open Drive Files
Click this button to start searching for files on a selected object.

Open Image
Click this button to open a previously created image.

Create Image
Click this button to create an image of a selected area.

Create Region
Click this button to create a region on a selected disk.



Create Virtual RAID
Click this button to create a virtual volume set or RAID.
Select an appropriate type from the menu.

Remove
Click this button to remove a selected object on the main panel.

Stop
Click this button to stop the current operation.

R-Studio has two operation modes:

File search on a partition (including recently found during disk scan).

In this mode, **R-Studio** analyzes MFTs on NTFS partitions, FATs on FAT partitions, and SuperBlocks on Ext2/3/4FS partitions. Then it displays all files which records have been found in the analyzed tables. Then recently deleted files, which records still remain, can be recovered. If files have not been found, that means that their records have been deleted. In this case, the disk must be scanned.

File search supports file masks and regular expressions. Multiple files in different folders can be found and recovered in one recover session.

R-Studio supports mass file recovery. There is no limit in the number of files that may be recovered during one session.

File content may be previewed before recovery.

File or disk binary data can be viewed and edited in the text/hexadecimal editor. Also can be viewed and changed all attributes for NTFS files.

Disk scan, searching for partitions.

In this mode, **R-Studio** scans the entire disk or its part. Using a number of statistic and deterministic criteria known as ***IntelligentScan*** technology, it determines existing or existed partitions on the disk, and their file systems. It is also possible to add new partitions, by setting manually all required parameters.

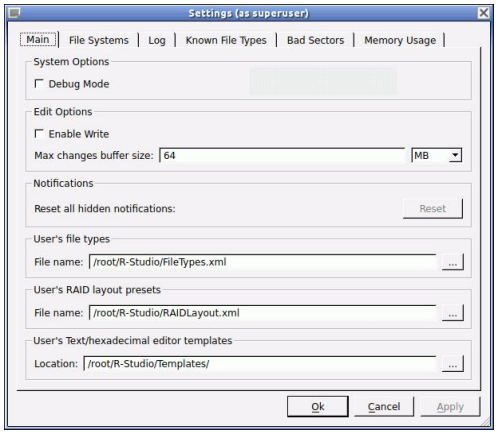
A disk can be scanned through several successive scans, each with its own parameters. **R-Studio** accumulates the information from successive scans and keeps track of changes in the information obtained from different scans. The information obtained from the disc scan can be stored in a file. It may be loaded and processed later at any convenient time.

1.5 R-Studio Settings

You may specify some global setting for **R-Studio** on the Settings dialog box. You may reach it by selecting **Settings** on the **Tools** menu.

Main

Main **dialog box**



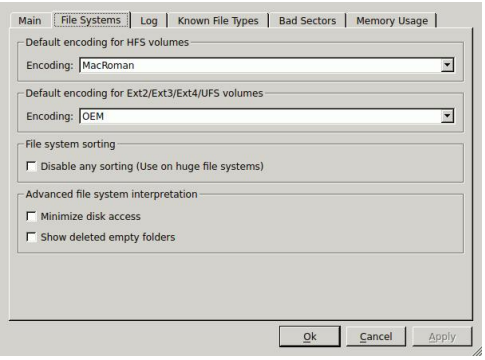
Main settings

System Options	
Debug Mode	If this check box is selected, **R-Studio** displays an additional command **Create FS Snapshot** on the context menu for an object with a file system. An FS Snapshot contains system data for the file system only (file descriptions without file contents). If a problem appears, this snapshot can be sent to **R-Studio** technical support to identify the problem. This option greatly slows **R-Studio**.
Edit Options	
Enable Write	If this check box is selected, **R-Studio** enables you to write any changes made in the **Text/hexadecimal editor**.
Max changes buffer size	Maximum amount of data stored for the **Undo** command in the **Text/hexadecimal editor**.
Notifications	
Reset all hidden notifications	This button enables all previously disabled notification and warning messages.
User's file types	
File name	Specifies a file name and path to the file where the descriptions of user's known file types are stored. You need to re-start **R-Studio** or

	click the Reload User's File Types button on the Known File Types tab for the new file to take effect.
User's RAID layout	
File name	Specifies a file name and path to the file where the descriptions of user's RAID layouts are stored
HexView templates path	
Location	Specifies the path for pattern description files for **Text/ Hexadecimal editor**.

File Systems

File Systems **dialog box**

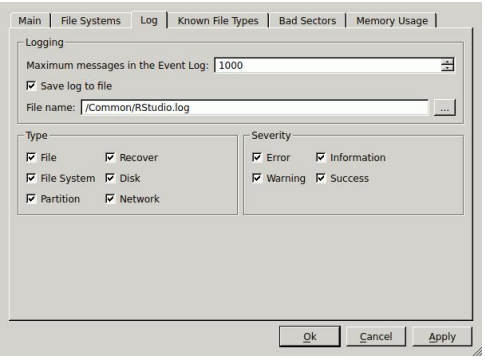


File Systems

Default encoding for HFS volumes	Select the national encoding for the HFS partitions.
Default encoding for Ext2/Ext3/ Ext4/UFS volumes	Select the national encoding for the Ext2, Ext3, Ext4, and UFS partitions.
Disable any sorting	Select this option if the number of files on the disk is so large that **R-Studio** sorts files in selected folders for too long time.

Log

Log **dialog box**



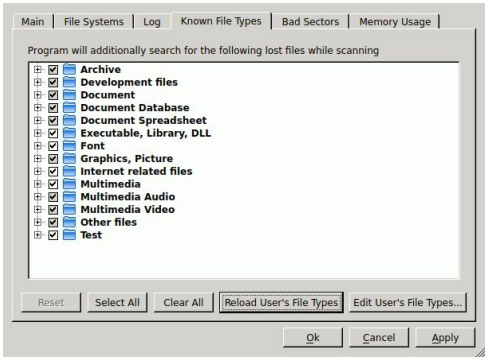
Log options

Logging	
Maximum messages in the Event Log	Specifies the maximum number of messages **R-Studio** will keep in the event log

Save log to file	If this check box is selected, **R-Studio** writes its log into a log file specified in the File name field.
File name	Specifies the file name in which the log will be saved.
Type	
File	If this check box is selected, **R-Studio** logs all events with recovered files.
File System	If this check box is selected, **R-Studio** logs all events with the file system.
Partition	If this check box selected, **R-Studio** logs all events with partitions.
Recover	If this check box is selected, **R-Studio** logs all events with the recovering processes.
Disk	If this check box is selected, **R-Studio** logs all events with disks.
Network	If this check box is selected, **R-Studio** logs all events with network operation.
Severity	
Error	If this check box is selected, **R-Studio** adds error messages into its log.
Warning	If this check box is selected, **R-Studio** adds warning messages into its log.
Information	If this check box is selected, **R-Studio** adds information messages into its log.
Success	If this check box is selected, **R-Studio** adds success messages into its log.
NEVER WRITE A LOG FILE ON THE DISK FROM WHICH YOU RECOVER DATA!!! Or you may obtain unpredictable results and lose all your data.	
Note: If in the Recover dialog box the Condense successful restoration events check box is selected, the Log will display only Error, Warning, and Information event messages.	

Known File Types

Known File Types **dialog box**



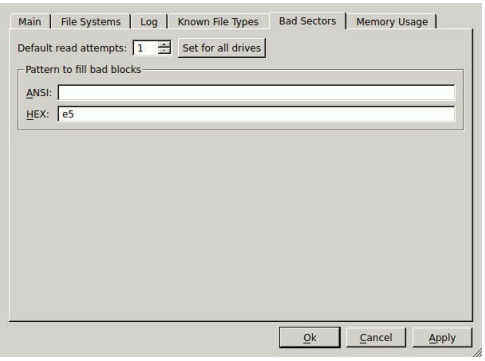
You may specify which **Known File Types** will be enabled/disabled by default. You may also specify know file types to search for during a specific scan session on the Scan dialog box.

Known File Types

Reset	Click this button to reset the settings to the previous state. Active until the **Apply** button is clicked.
Select All	Click this button to select all file types in the list.
Clear All	Click this button to clear all file types in the list except some predefined ones.
Reload User's File Types	Click this button to apply new file types after the user's file types file has been changes from the Main tab.
Edit User's File Types	Click this button to add a new customer's Known File Type, or to edit already existing ones. See the Customizing File Types help page for more details.

Bad Sectors

Bad Sectors **dialog box**

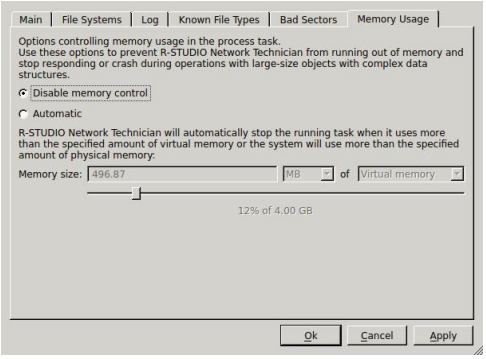


Bad Sectors settings

Default read attempts	Specifies a default value for I/O Tries, or how many times **R-Studio** will try to read a bad sector. You may specify this parameter for each drive separately on the Properties tab. **R-Studio** treats bad sectors in the following way: It reads a certain part of disk (predefined by Windows) and • If Default read attempts is set to 0, the entire part with bad sectors will be filled with the specified pattern. • If Default read attempts is set to a non-zero value, **R-Studio** reads again that part sector by sector, repeating the attempts the specified number of times. If **R-Studio** still cannot read a bad sector, it fills the sectors with the specified pattern. In this case only the bad sectors will be filled with the pattern, but that extremely slows the disk read process. For example, if you set Default read attempts to 1, a bad sector will be read 2 times.
Set for all drives	Click this button to reset I/O Tries for all drives to the default value.
Pattern to fill bad blocks	Specifies a default pattern **R-Studio** will use to fill bad sectors in files to recover, in images, or when showing data in the **Text/hexadecimal editor**. You may specify the pattern either in the ANSI or Hex data format. **Note: R-Studio** will never ever try to write anything on the disk from which data is to recover or an image is to create.

Memory Usage

Memory Usage **dialog box**


Main
File Systems
Log
Known File Types
Bad Sectors
Memory Usage
Options controlling memory usage in the process task.
Use these options to prevent R-STUDIO Network Technician from running out of memory and stop responding or crash during operations with large-size objects with complex data structures.
Disable memory control
Automatic
R-STUDIO Network Technician will automatically stop the running task when it uses more than the specified amount of virtual memory or the system will use more than the specified amount of physical memory.
Memory size:
496.87
MB
of
Virtual memory
12% of 4.00 GB
Ok
Cancel
Apply

These settings control how much memory **R-Studio** uses for its work. They help preventing **R-Studio** from locking when trying to perform very memory-consuming tasks like scanning large disks or processing file systems with a lot of files.

Memory Usage settings

Disable memory control	If this option is selected, the memory control is disabled.
Automatic	If this option is selected, **R-Studio** will automatically stop performing the task when the amount of used memory reaches the specified value. You may specify the limit for either the virtual or physical memory.

You may see how much memory **R-Studio** actually uses on the Memory Usage dialog box.

II Data Recovery Using R-Studio

Depending on the situation, data recovery may vary:

1. **Recovery of deleted files that have resided on an existing logical disk**

   This can be done using Basic File Recovery.

2. **Recovery of files that have resided on a data disk with a damaged file system, or on a previously deleted or re-formatted partition**

   If the file system on such logical disk is damaged, the operating system sees that logical disk as a partition without a valid file system. Such partition should be previously scanned. Also, it should be scanned if you want to recover data on a previously deleted or re-formatted partition.

   When the partition is scanned, a number of recognized partitions will appear. **R-Studio** shows them in different colors depending on which elements of the partition have been found.

Partition5	An existing logical disk or partition
Recognized6	Both boot records and file entries are found for this partition
Recognized19	Only file entries are found for this partition
Recognized29	Only boot records are found for this partition
Empty Space17	Empty space on the object
Extra Found Files	Files that have been found using scan for known file types.

Although such recognized partitions are virtual objects, files can be searched for and recovered from recognized partitions as from real logical disks using Basic File Recovery.

To successfully recover files from a recognized partition, it is necessary to find a right one which corresponds

to the real logical disk on which the files resided. No strict rules can be applied to that, but the following considerations should be taken into account:

- If you are going to recover files from a **disk with a damaged file system**, most likely the right recognized partition will be a green one.
- If you are going to recover files from a **previously deleted or re-formatted partition**, most likely the right recognized partition will be a yellow one.

Also always check the recognized partition's file system, start point, and size. They should be the same for the recognized partition and real logical disk/partition. When in doubt, try to preview a couple of files from the recognized partition. If the files are seen correctly, this is the right partition.

3. **Data recovery from a damaged system disk. The computer does not start up.**
   - If this computer is on a network, create an **R-Studio Agent Emergency** startup disk for the computer, install **R-Studio** on another computer on the network, and recover data over network.
   - If this computer is stand-alone, create an **R-Studio Emergency** startup disk and use it to start up the computer and recover data. You may use external USB hard disks to store recovered files.

R-Studio Features
Contact Information and Technical Support
Basic File Recovery
Advanced Data Recovery
Mass File Recovery
Volume Sets and RAIDs
Data Recovery over Network
Text/hexadecimal editor
Technical Information and Troubleshooting
R-Studio Emergency
R-Studio Agent Emergency

2.1 Basic File Recovery

NEVER TRY TO SAVE RECOVERED FILES/FOLDERS TO THE SAME LOGICAL DISK WHERE THEY RESIDE!!!

Or you may obtain unpredictable results and lose all of your data.

See the **Data Recovery Issues** topic for details.

Basic file recovery can be made for deleted files that has resided on an existing logical disk visible to the operating system. In all other cases, Advanced Data Recovery is required.

To recover deleted files from a logical disk (recognized partition),

1 **Double-click a logical disk on the R-Studio's** Drives **panel to enumerate files on the disk**

Other ways to enumerate files

- Select the disk and click the **Open Drive Files** button,

or

- Right-click the selected disk and select **Open Drive Files** on the context menu,

or

- Select **Open Drive Files** on the **Drive** menu

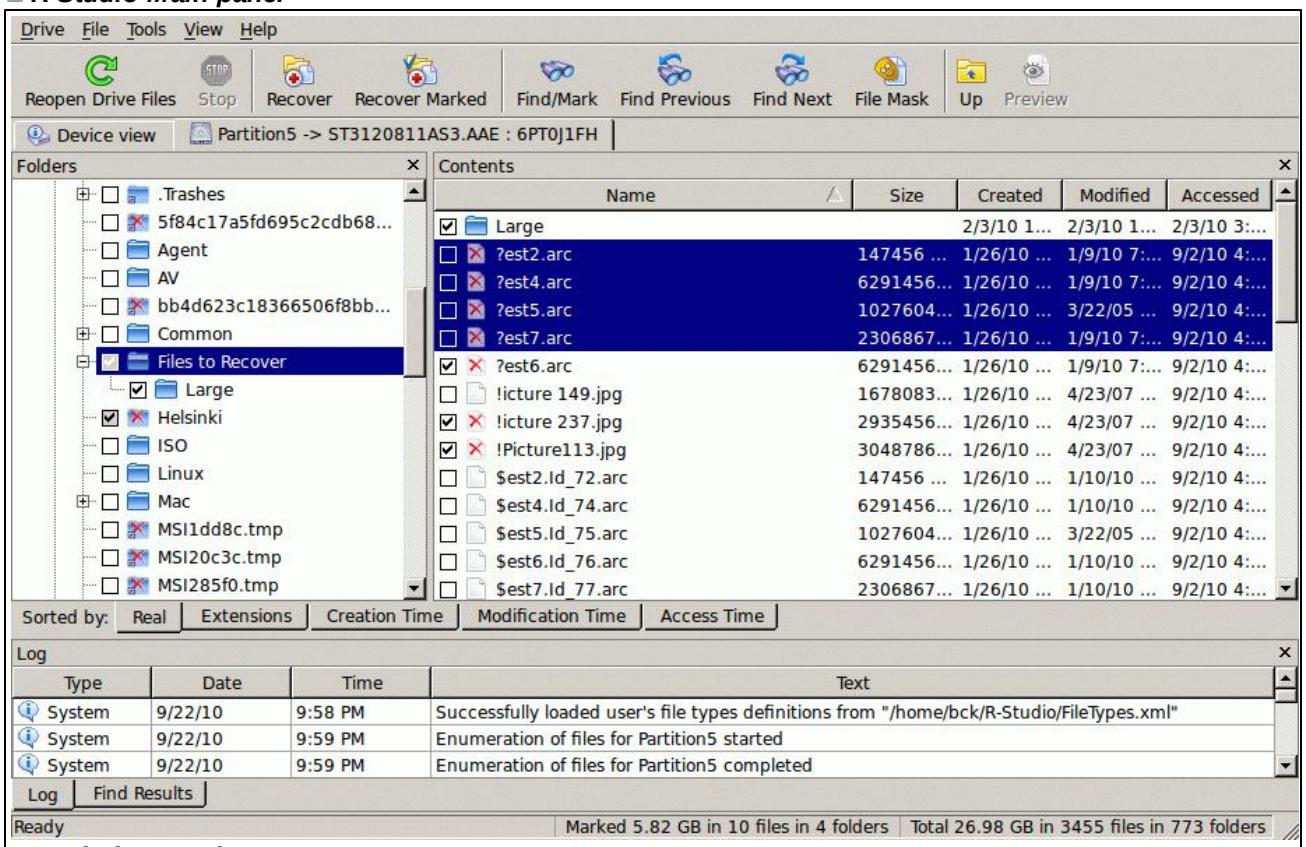
If you try to enumerate files on a hard drive or another object without a valid file system on it, a Double-click a logical disk... message will appear. Select a logical disk on the object or scan the object.

> **R-Studio will change its panel showing the disk's folders/files structure**

R-Studio analyzes data on the object and displays all files for which records have been found in the analyzed tables. If files have not been found, that means that their records have been deleted. To find such files, Advanced Data Recovery is required.

Please note that **R-Studio** shows only those files/folders that match a specified file mask.

R-Studio Main panel



Panel view options

You may set which panels and bars to enable/disable. To enable/disable

The **Toolbar**	Select/clear **Toolbar** on the **View** menu
The **Status** bar	Select/clear **Status bar** on the **View** menu
The Folders panel	Select/clear **Folders View** on the **View** menu
The Files panel	Select/clear **Contents View** on the **View** menu
The Log panel	Select/clear **Event Log** on the **View** menu
The Find Results panel	Select/clear **Find Results** on the **View** menu

You may also arrange the data as required. On the **View** menu, select **Arrange** and them a required arrangement.

You may specify which columns will be visible on the Files panel. On the **View** menu, select **Contents Columns**, and select the columns you want to see.

Folders panel

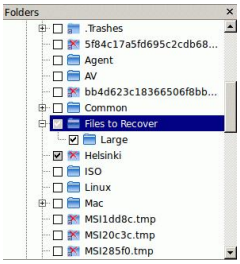
Deleted folder

Marked folder (all child objects in this folder are marked)

Partially marked folder (some child objects in this folder are marked)

Cross-linked folder (A FAT folder containing data which also belongs to other FAT folders.)

Questionable deleted folder (A FAT folder found by **R-Studio**, but with apparently invalid content.)

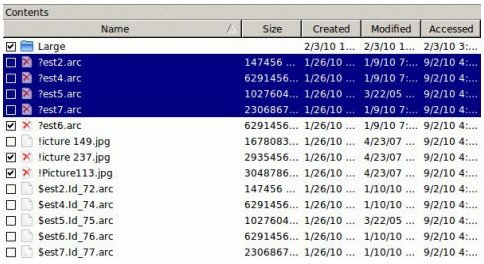


Files panel:

Deleted file:

Marked deleted file

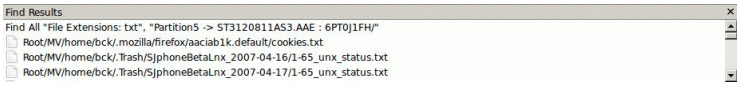
Selected deleted file



You may also arrange the data as required: by their extensions, creation/modification time, or as a real file structure

See Find and Mark Multiple Files for more details

Find Results panel



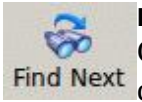
Select Drive
Click this button to return to the **R-Studio** main panel to select another drive.

Reopen Drive Files
Click this button to list files again.

Recover
Click this button to recover selected folders/ files.

Recover Marked
Click this button to recover marked folders/ files.

Find
Click this button to find or/and mark a particular file/folder.

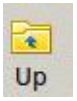


Find Next
Click this button to find the next object specified in the **Find/Mark** dialog box

Find Previous
Click this button to find the previous object specified in the **Find/Mark** dialog box.

File Mask
Click this button to specify a file mask.

Stop
Click this button to stop the current operation.



Up
Click this button to move highlighting one folder up.

The Log panel will show how many files and folders are on the object, and their size. You may specify which events will be shown in the log pane by setting a log filter.

Note: Metafiles are the file system's internal files invisible to any user, or file system data, which **R-Studio** represents as files. These files do not contain user data directly. Unless you want to scrutinize a disk file system, do not restore them.

If the Too many files... message appears, you may temporally stop file listing and browse through found files. Then you can resume file listing. You also may skip this file topic and continue. **R-Studio** will keep information about the entire file structure.

2 Select a file/folder to recover

You may select several files/folders in the same parent folder by pressing the **Shift** button and clicking the objects simultaneously.

Marking multiple files/folders from different parent folders manually:

Mark a file/folder to recover by clicking the box left to the object, or select **Mark** on the context menu. You may mark several files/folders in different parent folders. You may mark all objects in the folder by

selecting **Mark All** on the **Tools** or context menu. To unmark an object, click the box left to the object once more or select **Unmark** on the context menu. You may unmark all objects in the folder by selecting **Unmark All** on the **Tools** or context menu.

The Log panel will show how many files and folders you have marked, and their total size.

R-Studio can search for a particular file. Go to the Searching for a File topic for details. If you need to find and mark many files, go to the Find and Mark Multiple Files topic for details.

File content may be previewed before recovery. Go to the Previewing Files topic for details.

If you do not find files that you want to recover:

Sometimes **R-Studio** can find the files but not the entire file paths to them. It puts such files into the **Extra Found Files** folder. Try to search for the files there. If that does not help, try to find them by using file search globally on the entire disk. Go to the Searching for a File topic for details

If you still cannot find files that you want to recover but are sure they have existed on the logical disk, you need to use Advanced Data Recovery to find them.

3 Click the Recover or Recover Marked button

Other ways to recover selected files

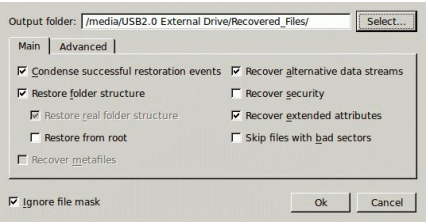
- Right-click the selected file/folder and select **Recover** or **Recover Marked** on the context menu,

or

- Select **Recover** or **Recover Marked** on the **File** menu.

4 Specify recover options and output folder on the Recover dialog box and click the OK button

Recover dialog box



If you have another computer connected to **R-Studio** over network, the Recover dialog box will be slightly different. See **Data recovery over network** for details.

Recover options

Condense successful restoration events	If this check box is selected, **R-Studio** will display only error and warning messages in its Log
Restore folder structure	If this check box is selected, **R-Studio** recovers the entire path to the selected object.
Restore from root	If this check box is selected, **R-Studio** recovers the entire path to the selected object starting from the root folder of the disk.
Recover metafiles	If this check box is selected, **R-Studio** recovers disk metafiles. Metafiles are the file system's internal files invisible to any user, or file system data, which **R-Studio** represents as files. These files do not contain user data directly. Unless you want to scrutinize a disk file system, do not restore them.
Recover alternative data streams	If this check box is selected, **R-Studio** recovers alternative data streams for file systems that support them. Has no effect on FAT files. See **Extended Information Recovery** for the NTFS file

	system, and **Data Recovery on HFS/HFS+ File System** for the Mac computers.
Recover security	If this check box is selected, **R-Studio** recovers security attributes for NTFS files. Has no effect on FAT files. See **Extended Information Recovery** for details.
Recover extended attributes	If this check box is selected, **R-Studio** recovers extended (HPFS) file attributes.
Remove hidden attributes	If this check box is selected, **R-Studio** removes the Hidden and System attributes from recovered files enabling the user to see them in the Windows Explorer.
Recover real folders structure	Enabled when the files are sorted by their extensions or date. See **Find and Mark Multiple Files** for details. If this check box is selected, **R-Studio** recovers the real folders/files structure on the disk rather than that of sorted files.
Skip files with bad sectors	If this check box is selected, **R-Studio** skips files with bad sectors and displays their list on the Files with bad sectors dialog box when the recovery has been completed. You may separately decide later what to do with those files. See **Bad sectors** for details. If this check box is cleared, **R-Studio** tries to read those sectors several times (specified on the Settings/Bad Sectors dialog box), and, if fails, fills bad sectors in the recovered file with the pattern specified on the same box. Information about such files will appear in the Log.
Ignore file mask	If this check box is selected, **R-Studio** recovers all content of a selected folder, ignoring a specified **File Mask**.
Advanced	Specifies options for mass file recovery

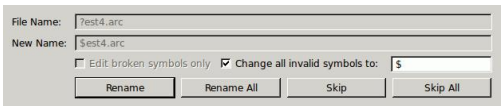
If you want to recover multiple files at once, go to the Recover Multiple Files for more information

NEVER TRY TO SAVE RECOVERED FILES/FOLDERS TO THE SAME LOGICAL DISK WHERE THEY RESIDE!!!

Or you may obtain unpredictable results and lose all of your data.

If a file to be recovered appears to have an invalid name, a Broken File Name dialog box will appear. You may correct the name and resume file recovery.

Broken File Name **dialog box**



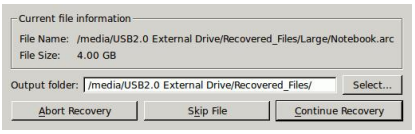
Broken File Name properties

File name	Shows the current incorrect file name.
New name	Field for a new file name.
Edit broken symbols only	If this check box is selected, only invalid symbols may be corrected
Change all invalid symbols to	If this check box is selected, all invalid symbols will be changed to

	the specified symbol
Buttons	
Rename	Click to resume file recovery
Rename All	Click to resume file recovery. All other files will be renamed according to the specified rule.
Skip	Click to skip this file
Skip All	Click to skip all files and stop file recovery

If there is no space available for the recovered files, the There is not enough space on the disk dialog box will appear. You may either select other place to store the files, skip that particular file or abort the recovery process.

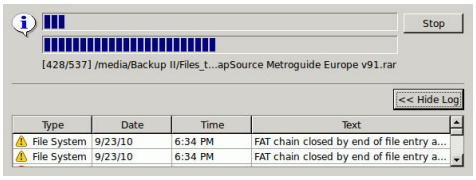
There is not enough space on the disk **dialog box**



> **R-Studio will recover the selected/marked files/folders to the specified folder and show the results in the** Log **pane**

The Recovery progress indicator will show the log and progress of recovery process.

Recovery progress indicator


Stop
[428/537] /media/Backup II/Files_t...apSource Metroguide Europe v91.rar
<< Hide Log
Type
Date
Time
Text
File System 9/23/10 6:34 PM FAT chain closed by end of file entry a...
File System 9/23/10 6:34 PM FAT chain closed by end of file entry a...

Note: R-Studio recovers files from Ext2FS partitions, but writes it to FAT or NTFS local disks. Or you may write such files to network disks. **R-Studio** successfully recovers files from Ext2FS partitions except its security attributes. **R-Studio** recovers *symlinks* as files containing the path to files which *symlinks* point to.

See **Data Recovery on HFS/HFS+ file system** for details on recovering data from disks with the HFS/ HFS+ file system

Previewing Files
File Masks
Regular Expressions
Event Log

2.1.1 Searching for a File

R-Studio can find a particular file, if it is difficult to find it manually on the Folders or Files panel. You can also automatically mark/unmark all found files.

To search for a file,

1 Click the Find button

Other ways to search for the file

- Right-click a folder and select **Find** on the context menu,

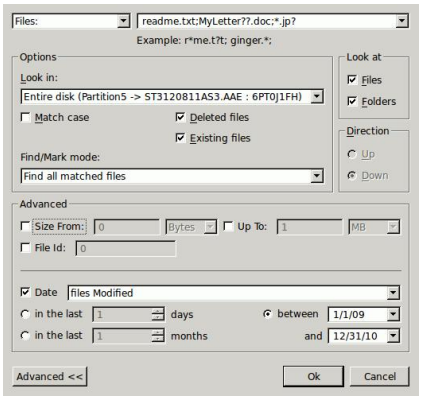
or

- Select a folder and select **Find** on the **Tools** menu

2 Specify a file to be found and its options on the Find **dialog box, and click the OK button**

Note that a **File Mask** may be applied.

Find / Mark (Main) **dialog box**



Find/Mark options

You may specify how to treat specified strings. Please note that **R-Studio** stores previously entered search strings.	
Files	If this option is selected, **R-Studio** treats specified strings as file names. Use ? for one unspecified character and * for an unlimited number of them to specify file masks.
File Extensions	If this option is selected, **R-Studio** treats specified strings as file extensions
Regular Expressions	If this option is selected, **R-Studio** treats specified strings as regular expressions
All Files	If this option is selected, **R-Studio** applies Advanced Options to all files.
Options	
Match case	If this check box is selected, **R-Studio** makes a case-sensitive search
Look in	Specifies where **R-Studio** searches for, and marks, files. It can look for them on the Entire disk, From current folder, In the Current folder and subfolders, and in the Current folder only. If From current folder is selected, you may also specify the Direction for the search from the current position in the current folder.
Deleted files	If this check box is selected, **R-Studio** makes a search among deleted files/folders.
Existing files	If this check box is selected, **R-Studio** makes a search among existing files/folders.
Find/Mark mode	Specifies what **R-Studio** does with the found files. It may: Find all matched files. **R-Studio** searches for all matched files. The search results appear on the Find Results panel. Find first matched file. **R-Studio** stops at the first found file. Mark matched files. **R-Studio** marks all found files. Unmark matched files. **R-Studio** unmarks all found files. Please note, that when performing a new find and mark/unmark task, **R-Studio** does not takes into consideration the previous marked/unmarked state of files. For example, if you first mark all doc files, and then all txt files, all doc files remain marked, too. To unmark them, you should specify doc once again and select Unmark matched files.
Look at	
Files	If this check box is selected, **R-Studio** includes files into a search.

Folders	If this check box is selected, **R-Studio** includes folders into a search.
Direction	Specifies search direction from the current position. Available only if From current folder is selected in Look in.
Advanced Options	
Size from/up to	Specifies file size limits.
File Id	Specifies File Id that **R-Studio** assigns to a file.
Date	Specifies file date boundaries. Files may be Modified/Created/Last Accessed.

> **R-Studio will show/mark the found file(s)**

If you need to find and mark many files, go to the Find and Mark Multiple Files topic for details.

To repeat the search,

* **Click the Find Next or Find Previous buttons**

Other ways to repeat the search

- Right-click a folder and select **Find Next** or **Find Previous** on the context menu

or

- Select a folder and select **Find Next** or **Find Previous** on the **Tools** menu

To find all files and show them on the Find Results **panel,**

* **Select** Find all **on the on the** Find **dialog box,**

or

select **Find all** on the **Tools** menu

> **R-Studio will show the found files on the** Find Results **panel**

You may do the following actions on the found files:

Recover, **Mark**, **Preview**

by right-clicking the found file and selecting the appropriate item in the context menu.

2.1.2 Finding Previous File Versions

R-Studio can find previous versions of files. It searches for them in the file's current folder and in **Extra Found Files**.

File versions are searched for using file size. If the size of a files is within 10% of the original filesize, the following conditions are checked:

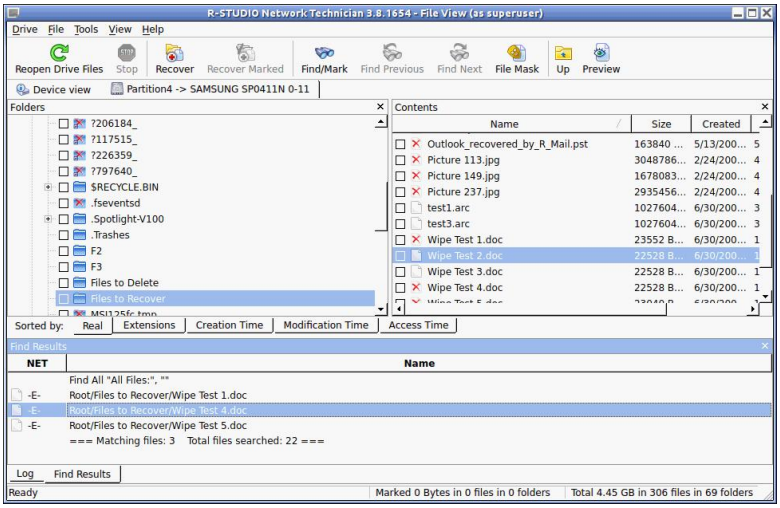
Conditions	Legend
File name	N
File extension	E
Recognized file type	T

To search for previous file versions,

1 Right-click the file and select Find Previous Versions of the File on the context menu

*** R-Studio will show the files in the list:**

File versions


R-STUDIO Network Technician 3.8.1654 - File View (as superuser)
Drive File Tools View Help
Reopen Drive Files Stop Recover Recover Marked Find/Mark Find Previous Find Next File Mask Up Preview
Device view Partition4 -> SAMSUNG SP0411N 0-11
Folders
Contents
Name Size Created
Outlook_recovered_by_R_Mail.pst
Picture 113.jpg
Picture 149.jpg
Picture 237.jpg
test1.arc
test3.arc
Wipe Test 1.doc
Wipe Test 2.doc
Wipe Test 3.doc
Wipe Test 4.doc
Sorted by: Real Extensions Creation Time Modification Time Access Time
Find Results
NET Name
Find All "All Files:", ""
Root/Files to Recover/Wipe Test 1.doc
Root/Files to Recover/Wipe Test 4.doc
Root/Files to Recover/Wipe Test 5.doc
=== Matching files: 3 Total files searched: 22 ===
Log Find Results
Ready
Marked 0 Bytes in 0 files in 0 folders
Total 4.45 GB in 306 files in 69 folders

This technique can be used to find deleted original files after attacks of file encrypting viruses.

2.1.3 Previewing Files

R-Studio has a built-in file previewer that allows you to preview both existing and deleted files. You may use this feature to estimate recovery or a file to be recovered.

To preview a file

1 Right-click a file to preview on the Files **panel and select Preview on the context menu**

Other ways to preview the file

- Select the file on the Files panel and click the **Preview** button,

or

- Select the file on the Files panel and select **Preview** on the **File** menu

> R-Studio will show the content of the file

If you have several files open in the previewer, you may instantly close all of them by selecting **Close All Previews** on the **File** menu.

List of supported file formats

Graphic files:		
Format	**Extension**	**Compression**
Adobe Photoshop Document	psd	
Amiga IFF	iff blk	Rle
CompuServe GIF	gif giff	
Dr. Halo files	cut pal	
Microsoft DirectDraw Surface texture file	dds	
OpenEXR Bitmap	exr	

Apollo HDRU	hdr	
Gimp Icon	ico	
Imaging Fax	g3n	
Joint Bi-level Image Group File	jbig	
Joint Photographic Experts Group	jpg jpeg jif jfif	
JPEG Network Graphic Bitmap	jng	
KOALA files	koa koala	
Kodak Photo CD	pcd	
Multiple Network Graphics	mng	
OS/2 Bitmap	bmp bga	Rle 4 & 8 bits
Portable Bitmap	pbm rpbm	
Portable Greyscale	pgm rpgm	
Portable Image	pnm rpnm	
Portable Network Graphics	png	
Portable Pixmap	ppm rppm	
Silicon Graphics RGB	rgb bw iris sgi	Rle
Sun Raster Images	ras rast sun sr scr rs	
Sun TAAC file format	iff vff suniff taac	
TIFF Revision 6	tif tim tiff	Rle LZW LZW + Prediction
TrueVision Targa	tga pix bpx vda icb vst	Rle
Windows Bitmap	bmp rle rl4 rl8 sys	Rle 4 & 8 bits
Wireless Bitmap (level 0)	wbmp wbm wap	
X11 BitMap	xbm bm	
X11 PixMap	xpm pm	
Zsoft Publisher's Paintbrush	pcx pcc dcx	Rle

2.1.4 File Masks

R-Studio shows only those files/folders that match the specified file mask. File mask affects files/folders that are processed by the **Recover** and **Find** commands.

To specify a file mask,

1 Click the File Mask button

Other ways to specify the file mask

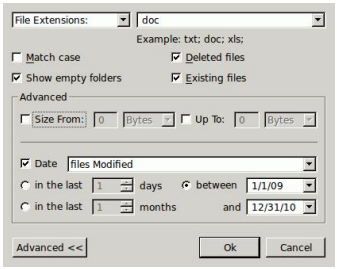
- Right-click a folder and select **File Mask** on the context menu

or

- Select the folder and select **File Mask** on the **Tools** menu

2 Specify the file mask on the File mask **dialog box and click the OK button**

Mask (Main) **dialog box**



File mask options

You may specify options for All Files, File Extensions, Files, and Regular Expressions	
Match case	If this check box is selected, **R-Studio** makes a case-sensitive search.
Show empty folders	If this check box is selected, **R-Studio** will show folders with no files matching the mask.
Deleted files	If this check box is selected, **R-Studio** makes a search among deleted files/folders.
Existing files	If this check box is selected, **R-Studio** makes a search among existing files/folders.
Advanced Options	
Size from/up to	Specifies file size limits.
Date	Specifies file date boundaries. Files may be Modified/Created/Last Accessed.

> R-Studio will show only those files that match the specified file masks

2.1.5 Regular Expressions

Regular expression is a notation for patterns of text, as opposed to exact strings of characters. The notation uses literal characters and metacharacters. Every character which does not have special meaning in the regular-expression syntax is a literal character and matches an occurrence of that character. For example, letters and numbers are literal characters. A metacharacter is a symbol with special meaning (an operator or delimiter) in the regular-expression syntax.

.	Wildcard: any character
*	Repeat: zero or more occurrences of previous character or class
^	Line position: beginning of line
$	Line position: end of line
[class]	Character class: any character in the set
[^class]	Inverse class: any character not in the set
[x-y]	Range: any characters within the specified range
\x	Escape: literal use of metacharacter x
\<xyz	Word position: beginning of the word
xyz\>	Word position: end of the word

For example, the following regular expression **.*** matches any string of characters, **^a** matches any string beginning with character a.

2.1.6 Event Log

R-Studio logs and displays events in the Log panel. You may set a **Log filter** to display only needed information and to write it to a log file. You may specify the log settings on the Settings dialog box.
You may clear or save the log

To clear the log,

* **Right-click the Log panel and select Clear Log on the context menu.**

To save the log to a file,

* **Right-click the** Log **panel and select Save Log to File on the context menu.**

2.2 Advanced Data Recovery

This chapter explains how to perform advanced data recovery operations.

- **Disk Scan**
- **Customizing File Types**
- **Customizing File Types-I**
- **Customizing File Types-II**
- **Regions**
- **Exclusive Regions**
- **Images**
- **Object Copy**

2.2.1 Disk Scan

In order to completely analyze data structure on an object, it must be scanned. Any object on the Drives panel can be scanned. In addition, you may create a ***region*** to scan only a part of an object. The **Regions** topic explains how to create and work with ***regions*****.**

You may select scan area and some other scan parameters. Scan information may be saved to a file and later this file may be opened.

Attention: Scanning large areas may be a very lengthy process!
NEVER TRY TO SAVE SCAN INFORMATION TO THE OBJECT BEING SCANNED!!!
Or you may obtain unpredictable results and lose all of your data.

To scan an object

1 **Select an object on the R-Studio's** Drives **panel**

2 **Click the Scan button**

Other ways to start scan

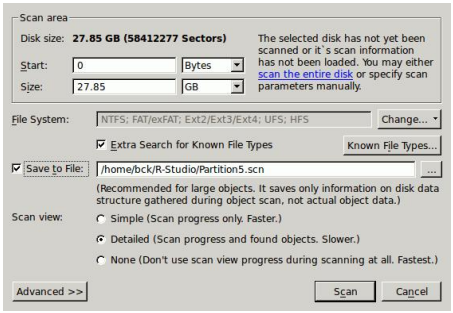
- Right-click the selected disk and select **Scan** on the context menu,

or

- Select **Scan** on the **Drive** menu

3 Specify the required parameters on the Scan dialog box and click the Scan button

Scan **dialog box**

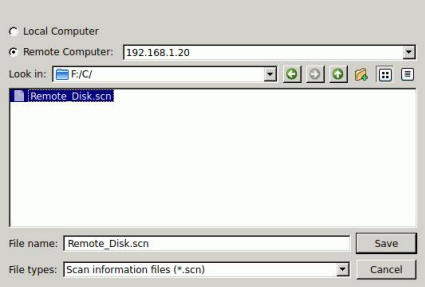

Scan area
Disk size: 27.85 GB (58412277 Sectors)
The selected disk has not yet been scanned or it`s scan information has not been loaded. You may either scan the entire disk or specify scan parameters manually.
Start: 0 Bytes
Size: 27.85 GB
File System: NTFS; FAT/exFAT; Ext2/Ext3/Ext4; UFS; HFS
Change...
Extra Search for Known File Types
Known File Types...
Save to File: /home/bck/R-Studio/Partition5.scn
(Recommended for large objects. It saves only information on disk data structure gathered during object scan, not actual object data.)
Scan view:
Simple (Scan progress only. Faster.)
Detailed (Scan progress and found objects. Slower.)
None (Don't use scan view progress during scanning at all. Fastest.)
Advanced >>
Scan
Cancel

Scan options

Disk Size:	Shows the size of the object to be scanned
Start:	Sets the start point of the area to be scanned.
Size:	Sets the size of the area to be scanned.
Numbers in these fields can be in bytes or sectors. If no letters are after the numbers, **R-Studio** assumes the numbers are in bytes. See **Data Formats** for more details.	
File Systems:	Specifies the file systems which objects are to be searched for. Current version supports: FAT, NTFS, exFAT, Ext2/3/4FS, HFS, and UFS file systems. Please note that if you need to scan an HFS, HFS+, or HFSX disk, always enable the Extra search for Known File Types option. This is very important because when files are being deleted on the HFS, HFS+, HFSX file systems, the computer completely removes all system information on them, and there is no way to recover the deleted files except by using the Extra Search for Known File Types option. See **Data Recovery on HFS/HFS+ file system** for details.
Extra search for Known File Types	Enables search for Known File Types.
Save scan Info to File:	If this checkbox is selected, **R-Studio** will save scan information to a specified file. Later this file may be opened. Please note, that this option does not save actual disk data, only information on disk data structure gathered during disk scan.
Simple view	If this option is selected, **R-Studio** will show only scan progress.
Detailed view	If this option is selected, **R-Studio** will show graphic representation on objects found during scan.
None	If this option is selected, **R-Studio** will not show the Scan Information tab during scan.
Buttons	
Scan	Starts scanning
Advanced	Activates advanced scan options
Known File Types...	Selects file types that **R-Studio** will recognize during the disk scan.
Cancel	Closes the dialog box

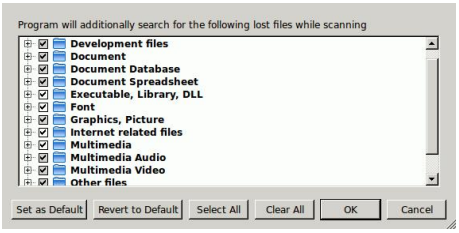
NEVER TRY TO SAVE SCAN INFORMATION TO THE OBJECT BEING SCANNED!!!
Or you may obtain unpredictable results and lose all of your data.

If a remote computer is connected for **Data Recovery over Network**, the Save Scan Information File dialog box will appear when you select a place to store scan info. You may save it to the local or remote computer.



Known File Types: While scanning, **R-Studio** can recognize the data's particular file type. Using such information, **R-Studio** can obtain more information about data/file structure on the object being scanned. By default, **R-Studio** tries to recognize the default list of supported file types specified on the Known File Types tab of the Settings panel, greatly increasing time required for the scan. You may reduce it by selecting only those file types that you need. Click the **Known File Types...** button and select the required file types on the File Types dialog box. These selections will be applied to that scan session only.

File Types **dialog box**



Known File Types

Set as Default	Click this button to set the current list of selected file types as default values.
Revert to Default	Click this button to revert the default settings specified on the Known File Types tab of the Settings panel.
Select All	Click this button to select all file types in the list.
Clear All	Click this button to clear all file types in the list except some predefined ones.

List of known file types

* By default, files of this type are not selected. If necessary, select them manually			
Document			
AbiWord Document: .abw	Adobe PDF document: .pdf	Final Draft Document: .fdr	FrameMaker Document: .fm
Garmin MapSource data: .mps	GNU Info Document: .info	HTML Document: .html	Lotus AMI Pro Document: .sam
Lotus Organizer Report: .rep	Lotus Word Pro Document: .lwp	Microsoft Money Data: .mny	Microsoft Office Open XML Document *
Microsoft OneNote	Microsoft Pocket	Microsoft PowerPoint	Microsoft PowerPoint

section file: .one	Streets Map File: .mps	2007 XML Document*: .pptx	Document*: .ppt
Microsoft Reader eBook: .lit	Microsoft Reader eBook annotations: .ebo	Microsoft Word 2007 XML Document*: .docx	Microsoft Word Document*: .doc
Microsoft Word2 Document: .doc	Microsoft WordPad Document: .wri	OLE Storage	OpenDocument Document
PostScript document:*.ps	QuickBooks Backup File: *.qbb	QuickBooks Primary Data File: *.qbw	Quicken Data: *.qdf
Rich Text Document: .rtf	TEX Document: .tex	Text Document: .txt	TurboTax return file:. tax
Unicode Document: .txt	Word for Macintosh Document: .mcw	WordPerfect Document: .doc	XML Document: .xml
Document: Spreadsheet			
Lotus Spreadsheet: .wks	Lotus3 Spreadsheet: .wk3	Microsoft Excel 2007 XML Document*: .xlsx	Microsoft Excel Document*: .xls
Microsoft Excel2 Spreadsheet: .xls	Microsoft Excel3/4 Spreadsheet: .xls	Quattro Pro Spreadsheet: .wq1	
Document: Database			
Data Interchange Format file: .dif	dBase III Database: .dbf	Microsoft Access 2007 Database: .accdb	Microsoft Access 2007 XML Document: .accdt
Microsoft Access Database: .mdb	Microsoft Linker Database: .lk	Microsoft Program Database: .pdb	Microsoft SQL Database: .mdf
Microsoft SQL Log: .ldf	MySQL Database: .myi	Omnis Studio Database: .df1	Omnis Studio Library: .lbs
Internet-related files			
Compiled HTML file: .chm	Internet shortcut: .url	Microsoft OutLook Personal Folder: .pst	Microsoft Outlook/ Inbox offline folder: .ost
Mozilla Firefox browser extension: .xpi	Mozilla Mail Summary file: .msf	Outlook Express Messages: .dbx	The Bat! Address book: .abd
The Bat! Message Base: .tbb	The Bat! Message Index: .tbi	Windows Address Book: .wab	XML document (Unicode): .xml
Font			
Adobe PostScript Font: .pfb	Adobe Printer Font: .pfm	BDF Unix font	BGI font: .chr
CPI DOS font: .cpi	MyTest Font: .mtf	TrueType Font: .ttf	Windows System Font: .fon
Graphics/Picture			
3D XML file: .3dxml	3DStudio Mesh: .3ds	Adobe InDesign	Adobe Photoshop

		File: .indd	Image: .psd
Agfa/Matrix Scodl Image: .scd	Alias Wavefront Raster Image: .rla	ArcView Shape:. .shp	AutoCAD Binary Image: .dxf
AutoCAD Drawing: .dwg	AutoCAD Image: .dxf	Autodesc Animator Image: .pic	Autodesc Animator Pro color map: .col
Autodesc Animator Pro Image: .pic	Autologic Image: .gm	AVHRR Satellite Image: .sst	Bentley MicroStation CAD Drawing: .dgn
BMF Image: .bmf	Canon RAW graphics file: .crw	Canon RAW graphics file*: .cr2	Canon RAW graphics file: .crw
ColoRIX Image: .rix	CompuServe GIF Image: .gif	ComputerEyes Raw Image: .ce1	Continous Edge Graphic Image: .ceg
Corel Texture Image: .tex	CorelDraw CMX Image: .cmx	CorelDraw Image: .cdr	Cubicomp Picture Maker Image
Dr. Halo palette: .pal	Enhanced MetaFile Image: .emf	Epson Stylus Image: .prn	Erdas LAN/GIS Image: .lan
Fractal Image Format: .fif	Freehand (MX) Database: .fh10	GEM Raster Image: .img	GEM VDI Image: .gdi
GOES Satellite Image: .goe	Graphics Workshop for Windows Thumbnail: .thn	Gridded Binary Image: .grb	Hitachi Raster Image: .hrf
Hotspot Image: .shg	HP Command Language Image: .pcl	HP Raster Image: .rtl	HSI JPEG Image: .hsi
IBM Picture Maker Image: *.pic	iPhoto Image: .attr	Jovian Logic Image: .vi	JPEG 2000: .jp2
JPEG Digital Camera*: .jpg	JPEG Image: .jpg	Kodak PhotoCD Image: .pcd	LBM/IFF Image: .lbm
Lightwave Object: .lwo	Lotus PIC Image: .pic	Macintosh Paint Image: .mac	Macintosh PICT Image: .pct
Microsoft Paint Image: .msp	Minolta RAW image: .mrw	Nikon RAW image*: .nef	Olympus RAW image: .orf
PaintShop Pro Image: .psp	PaperPort Image: .max	PBM Image: .pbm	PGM Image: .pgm
Pictor PC Paint Image: .pic	PIX Image: .pix	PM Image: .pm	PNG Image: .png
PPM Image: .ppm	Print Shop Image: .pds	QuarkXpress Database: .qxp	QuarkXPress file: .qxd
Quick Link II fax Image: .qfx	QuickDraw 3D Metafile: .3dmf	RenderMan Image: .rib	SGI Image: .sgi
Sigma RAW image: .x3f	Sketch Image: .sk	SmartDraw file: .sdr	SmartDraw template: .sdt
Sony RAW image: .arw	STAD Image: .pac	Sun Raster Image: .sun	SymbianOS Image: .mbm

Tagged Image Format File: .tif	TI Image: .92i	TrueVision Image: .tga	Utah Raster Toolkit Image: .rle
VITec Image: .vit	Windows Animated cursor: .ani	Windows Bitmap Image: .bmp	Windows cursor: .cur
Windows Fax Cover Image: .cpe	Windows icon: .ico	Windows MetaFile Image: .wmf	WordPerfect Graphics Image: .wpg
X PixMap Image: .xpm	X Window Dump Image: .xwd	Xara Drawing: .xar	ZSoft PCX Image: .pcx
Fuji RAW image: .raf			
Multimedia: Audio Files			
Advanced Streaming Format file: .asf	AIFF Sound: .aif	Amusic tracker: .amd	aPac Audio: .apc
AudioCD file: .cda	AVR Sound: .avr	CMF Music: .cmf	Creative Voice File: .voc
DiamondWare Sound: .dwd	Digital Speech File: .dss	Digital Voice File: .dvf	EA ASF/MUS Audio: .asf
Extended M3U playlist: .m3u	FLAC Audio	La Lossless Audio: .la	Liquid Audio: .la1
MIDI Instrument definition: .idf	MIDI Music: .mid	MIDI stream: .mds	Monkeys Audio: .ape
MPEG Layer I Audio: .mpg	MPEG Layer II Audio*: .mp2	MPEG Layer III Audio*: .mp3	MUS Music: .mus
Musepack Audio: .mpc	Next/Sun Sound: .au	Ogg Vorbis Audio: .ogg	OptimFROG Audio: .ofr
RIFF MIDI Music: .rmi	RK Audio Sound: .rka	Sierra AUD Sound: .aud	Sony OpenMG Audio: .oma
Super NES Audio: .spc	TTA Audio: .tta	VQF Sound: .vqf	WavPack Audio: .wv
Westwood AUD Sound: .aud	Windows Audio Compression Manager driver: .acm	Windows Media Audio: .wma	Windows WAVE Sound: .wav
X-MIDI Music: .xmi	ZyXEL Sound: .zyx		
Multimedia: Video Files			
3GPP multimedia audio/ video: .3gp	3GPP2 multimedia audio/video: .3g2	4X Movie Video: .4xm	Adobe Filmstrip Animation: .fsf
AMV Video: .amv	ANIM Animation: .cel	Autodesk Animator: .fli	BCS Video: .bcs
BINK Video: .bik	DeluxePaint Animation: .anm	Director Video: .dcr	DriveCam Video: .dce
DVM Video: .dvm	Eyemail Video: .eye	Flash Video: .flv	Google Video: .gvi
Intel DVI Video: .dvi	Intel Indeo Video File: .ivf	Interplay MVE Video: .mve	Lotus ScreenCam Video: .scm
LZA Animation: .lza	MPEG Video: .mpg	Nancy Codec	NEOchrome

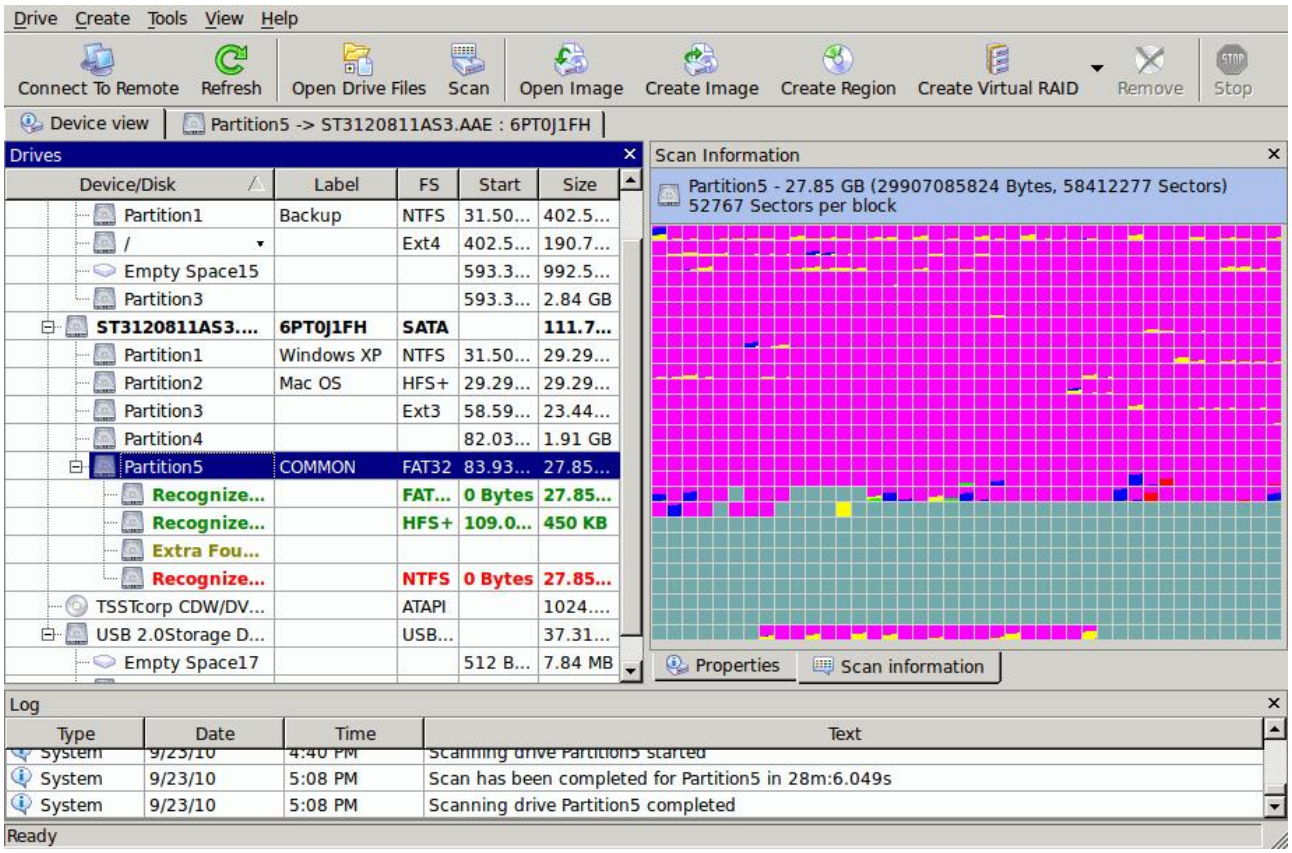
		Video: .noa	Animation: .ani
Nullsoft Video: .nsv	NuppelVideo (MythTV) Video: .nuv	QuickTime Video: .mov	QV-10 Video: .cam
RPL Video: .rpl	Sega FILM/CPK Video: .cpk	SGI movie format: .mv	Shockwave Video: .swf
Smacker Video: .smk	SMJPEG Video: .mjpg	Sony Movie Player Video: .mqv	VideoCD MPEG: .dat
VideoCD Video: .vcd	Vivo streaming Video: .viv	VOB video files: .vob	VP6 encoded Video: .vp6
Windows AVI Video: .avi	Windows Media Video: .wmv		
Multimedia Files			
Material Exchange File: .mxf	MP4 file: .mp4	Real Networks audio/ video: .rm	RIFF Multimedia File
Archive Files			
7-Zip archive: .7z	ACE archive: .ace	AIN archive: .ain	ARJ archive: .arj
ARX archive: .arx	Aladdin Systems StuffIt archive: .sit	BAG archive: .bag	BIX archive: .bix
BOA archive: .b58	BZip2 archive: .bz2	BlackHole archive: .bh	Blink archive: .bli
CPIO archive: .cpio	CRUSH archive	ChArc archive: .chz	Compress archive: .z
FOXSQZ archive: .sqz	GZip archive: .gz	HA archive *: .ha	HAP archive: .hap
HPACK archive: .hpk	Hyper archive: .hyp	InstallShield Cabinet archive: .cab	InstallShield Data archive: .z
InstallShield archive	JAM archive: .jam	JAR archive: .jar	JRC archive: .jrc
LHA/LZARK archive: *.lzh	LIMIT archive: *.lim	LZA archive: *.lza	LZOParchive: .lzo
LZSH archive	LZX archive: .lzx	Microsoft Cabinet archive: .cab	Microsoft Compress 5 archive
Microsoft Compress 6 archive	PAKLEO archive: .pll	Pack archive *	QFC archive: .qfc
Quantum archive *: .ark	Quark archive	RAR archive: .rar	RPM archive: .rpm
ReSOF archive: .sof	SAR archive: .sar	SBC archive: .sbc	SCO archive *
SQZ archive: .sqz	SZip archive	StuffIt archive: .sit	TAR archive: .tar
UFA archive: .ufa	UHArc archive: .uha	UltraCompressor 2 archive: .uc2	UltraCrypt 2 archive: .ue2
WIN-Freeze archive*: .ice	WRAptor archive: .wra	WinImp archive: .imp	YAC archive: .yc
YBS archive: .ybs	ZIP archive: .zip	ZOO archive: .zoo	ZZip archive: .zz
Apple Safari Web Archive: .webarchive	Microsoft Internet Explorer Web Archive: .mht	R-Drive Image Archive: .arc	R-Drive Image V1 Archive: .arc

WinImage Archive: `*.imz`			
Executable/Library/DLL			
DOS Style Executable: `.exe`	ELF Executable (UNIX)	ELF Library (UNIX)	ELF Module (UNIX)
Java Bytecode: `.class`	Novell NetWare executable: `.nlm`	RDOFF executable	Win32 DLL*: `.dll`
Win32 Executable*: `.exe`	Windows OCX File: `.ocx`		
Development files			
Borland Delphi 6 Library: `.dcu`	Borland Turbo Pascal compiled Unit: `.tpu`	COM Type Library: `.tlb`	Delphi 7 Compiled Unit: `.dcu`
Library: `.lib`	Microsoft .NET XML Resource template: `.resx`	Microsoft ClassWizard file: `.clw`	Microsoft Linker database
Microsoft Precompiled header: `.pch`	Microsoft Visual C++ Database: `.mdp`	Microsoft Visual Studio Database: `.dsp`	Microsoft Visual Studio Solution: `.sln`
Microsoft Program database	Microsoft Visual C++ project	Microsoft Visual Studio project	Microsoft Visual Studio workspace: `.dsw`
OMF Object library: `.lib`	VisualBasic Database: `.vbp`	Windows Compiled resource (16bit) *: `.res`	Windows Compiled resource (32bit): `.res`
Other file types			
ABBYY Lingvo dictionary: `.lsd`	File Crypt file: `.rzx`	Kaspersky Anti-virus data base: `.avc`	NOD32 Antivirus Update file: `.nup`
OziExplorer Map data:. `map`	RegEdit file: `.reg`	RegEdit file (UNICODE): `.reg`	Windows Backup File: `.bkf`
Windows Clipboard file: `.clp`	Windows Color Profile: `.icm`	Windows Minidump	Windows National locale: `.nls`
Windows Password file: `.pwl`	Windows Policy file: `.pol`	Windows Registry file: `.dat`	Windows Registry hive: `.hiv`
Windows shortcut: `.lnk`	WinHelp: `.hlp`	WinHelp Contents: `.cnt`	
Unreal Package	Java Applet cache index	Android Package	MySQL Database Dictionary
CrystalMaker Data File	AIX Backup File	Kaspersky Anti-Virus signature base	Audacity audio
PolySpace results	Kaspersky Anti-Virus database	ArtMoney Table file	D-LIB bytecode
Valve Texture File	Fallout 3 save game	PlayStation 3 Theme	OS/2 Icon
ACUCOBOL object	WinXP Prefetch file	XPCOM Type Library	iOS Package
Common Loudspeaker Binary			

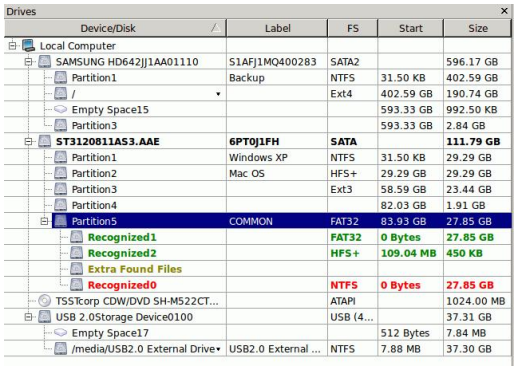
Note: Using scan for Known File Types, **R-Studio** can successfully recover only un-fragmented files. You may also specify your own file types for scanning. See **Customizing File Types** for details. User-defined file types precede over built-in ones, if their definitions overlap.
You may set the defaults for known file types on the **R-Studio Settings**.

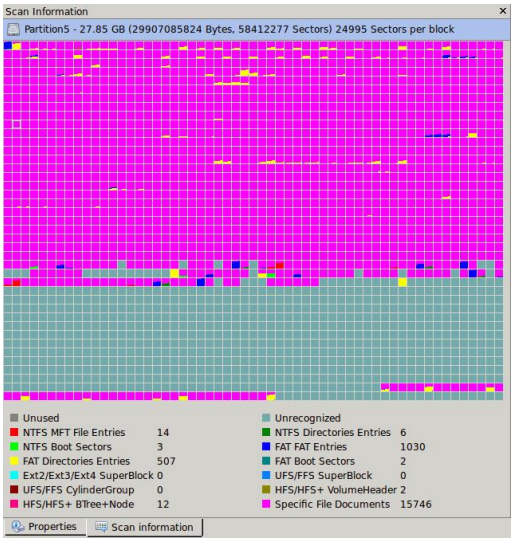
> **R-Studio starts scanning the object, and its panel will show information about new found objects:**

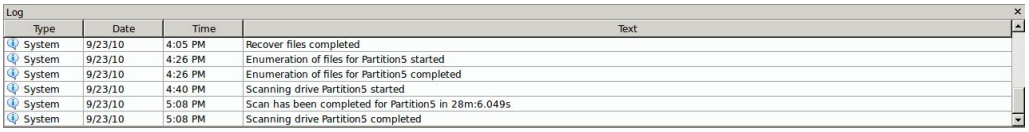
R-Studio Main panel



Drives panel after scanning:
You can select an object by clicking on it


Drives
Device/Disk
Label
FS
Start
Size
Local Computer
SAMSUNG HD642JJ1AA01110 S1AFJ1MQ400283 SATA2 596.17 GB
Partition1 Backup NTFS 31.50 KB 402.59 GB
/ Ext4 402.59 GB 190.74 GB
Empty Space15 593.33 GB 992.50 KB
Partition3 593.33 GB 2.84 GB
ST3120811AS3.AAE 6PT0J1FH SATA 111.79 GB
Partition1 Windows XP NTFS 31.50 KB 29.29 GB
Partition2 Mac OS HFS+ 29.29 GB 29.29 GB
Partition3 Ext3 58.59 GB 23.44 GB
Partition4 82.03 GB 1.91 GB
Partition5 COMMON FAT32 83.93 GB 27.85 GB
Recognized1 FAT32 0 Bytes 27.85 GB
Recognized2 HFS+ 109.04 MB 450 KB
Extra Found Files
Recognized0 NTFS 0 Bytes 27.85 GB
TSSTcorp CDW/DVD SH-M522CT... ATAPI 1024.00 MB
USB 2.0Storage Device0100 USB (4... 37.31 GB
Empty Space17 512 Bytes 7.84 MB
/media/USB2.0 External Drive USB2.0 External ... NTFS 7.88 MB 37.30 GB

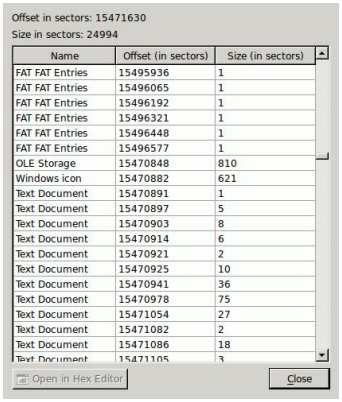



Log
Type Date Time Text
System 9/23/10 4:05 PM Recover files completed
System 9/23/10 4:26 PM Enumeration of files for Partition5 started
System 9/23/10 4:26 PM Enumeration of files for Partition5 completed
System 9/23/10 4:40 PM Scanning drive Partition5 started
System 9/23/10 5:08 PM Scan has been completed for Partition5 in 28m:6.049s
System 9/23/10 5:08 PM Scanning drive Partition5 completed

The Log pane will show scan progress. Scan may be stopped by clicking the **Stop** button on the toolbar. Later the scan process may be resumed with different scan parameters.

You may see which file object(s) is/are on a particular disk part. Click the corresponding rectangle on the Scan Information pane and view the information on the Scan Information dialog box.

Scan Information **dialog box**


Offset in sectors: 15471630
Size in sectors: 24994
Name Offset (in sectors) Size (in sectors)
FAT FAT Entries 15495936 1
FAT FAT Entries 15496065 1
FAT FAT Entries 15496192 1
FAT FAT Entries 15496321 1
FAT FAT Entries 15496448 1
FAT FAT Entries 15496577 1
OLE Storage 15470848 810
Windows icon 15470882 621
Text Document 15470891 1
Text Document 15470897 5
Text Document 15470903 8
Text Document 15470914 6
Text Document 15470921 2
Text Document 15470925 10
Text Document 15470941 36
Text Document 15470978 75
Text Document 15471054 27
Text Document 15471082 2
Text Document 15471086 18
Open in Hex Editor
Close

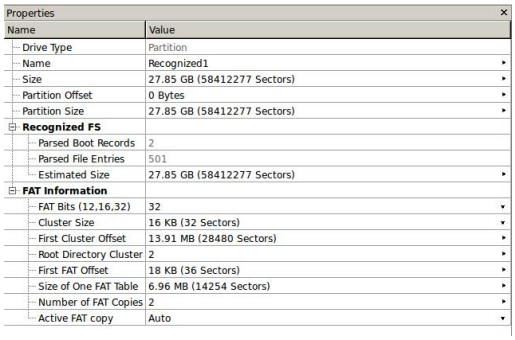
Double-click an object to view/edit the file object in the **Text/hexadecimal editor**.

When an object is scanned, a number of Recognized partitions will appear. **R-Studio** shows them in different colors depending on which elements of the partition have been found.

Partition5	An existing logical disk or partition
Recognized6	Both boot records and file entries are found for this partition
Recognized19	Only file entries are found for this partition
Recognized29	Only boot records are found for this partition
Empty Space17	Empty space on the object
Extra Found Files	Files that have been found using scan for known file types.

Although such recognized partitions are virtual objects, files can be searched for and recovered from recognized partitions as from real logical disks using Basic File Recovery.

To see the information about a newly found object, simply click it on the Drives panel. Click this link to see the information about the object Recognized1 on the Partition5:.



All scanned information may be deleted on the context menu for a scanned object.

Scan information may be saved in a file. Previously saved scan information may be loaded. This can be done on the **Drive** or context menu for a selected object.

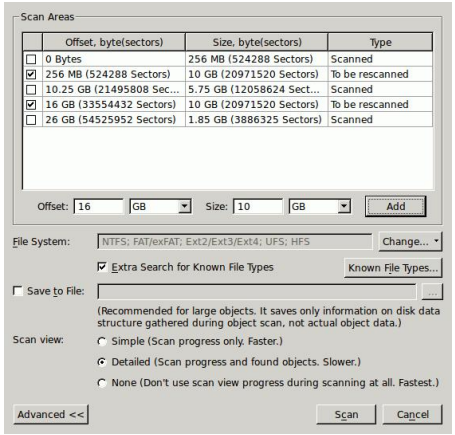
Multiple scans

If the selected object has been completely scanned, you may rescan it either completely or with new scan parameters. If the selected object has been scanned partially, you may scan the rest of the object, ignore the existing scan information and scan the entire object, or specify scan parameters manually.

R-Studio accumulates the information from successive scans and keeps track of changes in this information obtained from different scans.

You may make several scans of successive or overlapping areas. Click the **Advanced** button, specify an offset and size for a new area to scan on the Advanced Scan dialog box and click the **Add** button. You may specify and add several scan areas. You may select which areas should be scanned. Selected scan areas can be merged. Right-click a necessary area and select either **Merge Down**, **Merge Down All**, and **Merge Selected**.

Advanced Scan **dialog box**



Managing scan information

Scan information may be saved to a file. Previously saved scan information may be loaded.

To save scan information

1 **Select an object on the R-Studio** Drives **panel**

2 **Select Save Scan Information on the Drive or context menu and save the scan information in a file**

The default file extension is `*.scn`.

To load scan information

1 **Select an object on the R-Studio** Drives **panel**

2 **Select Open Scan Information on the Drive or context menu and select the required file with the scan information**

The default file extension is `*.scn`.

> **The scan information will appear in the** Drives **panel**

To remove scan information

1 **Select an object on the R-Studio** Drives **panel**

2 **Select Remove Scan Information on the Drive or context menu**

> **The scan information will disappear from the** Drives **panel**

NEVER TRY TO SAVE SCAN INFORMATION ON THE OBJECT BEING SCANNED!!!
Or you may obtain unpredictable results and lose all your data.

2.2.2 Customizing File Types

You may create your own known file types and add their file signatures for scanning in Known File Types. They will appear in their respective folders on the File Types dialog box.

You can do that either by using the **R-Studio's** graphic interface or by direct editing the known file description file specified on the **R-Studio** Main settings dialog box.

Creating a Known File Types using a Graphic User's Interface

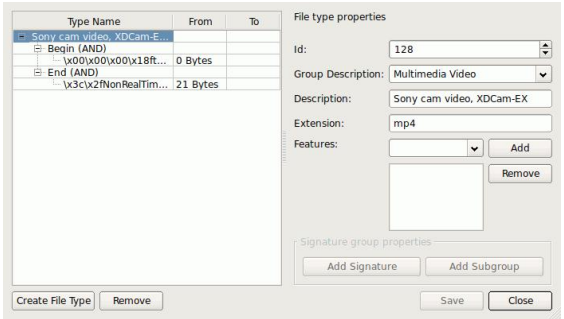
The easiest way to add your own is to use the **R-Studio's** graphic interface.

To create a Known File Type,

1 **On the** Main **settings dialog box, click the Edit User's File Types... button**

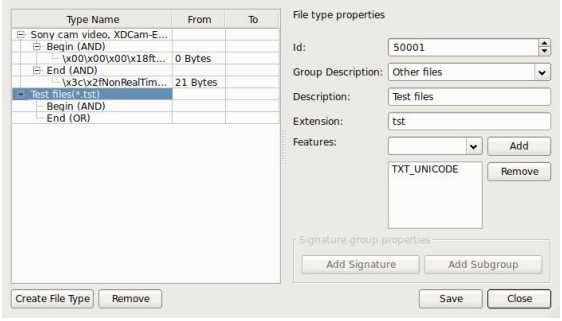
> **The** Edit User's File Types **dialog box will appear**

Edit User's File Types **dialog box**



2 Click the Create File Types button and specify File type properties

Edit User's File Types **dialog box**



File Types properties

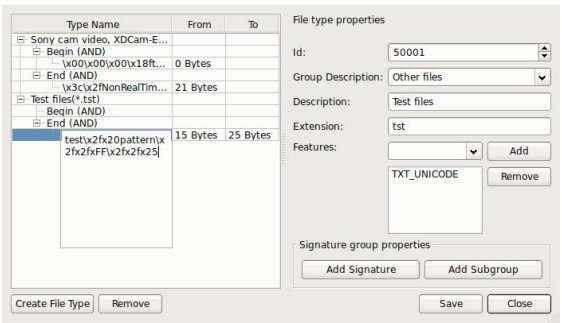
`id`	`digit`	Required	Digital file type identifier. Should be unique for each custom file type.
`group`	`string`	Optional	Specifies a file type group in which found files will appear. You may specify either your own groups or select those predefined on the File Types dialog box.
`description`	`string`	Optional	Brief file description

`features`	`NO_SCAN`
	`TXT_ANSI`
	`TXT_UNICODE`
		Optional	Additional properties of the file type. If you want to specify several properties, they should be separated by a space.
			`NO_SCAN`: Not to be scanned for. If this flag is used, **R-Studio** will not search for such file type. Such files will be shown when sorting files by their extensions.
			`TXT_ANSI`: The file can be viewed as ANSI text. If this flag is specified, the file can be correctly represented as an ANSI text. When previewing, this file will be immediately sent to **Text/ hexadecimal editor**.
			`TXT_UNICODE`: The file can be viewed as UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. When previewing, this file will be immediately sent to **Text/ hexadecimal editor**.

`extension`	`<string>`	Optional	File extension.

3 Click the Add Signature button, specify the signature parameters, and click the Save button

Edit User's File Types **dialog box**



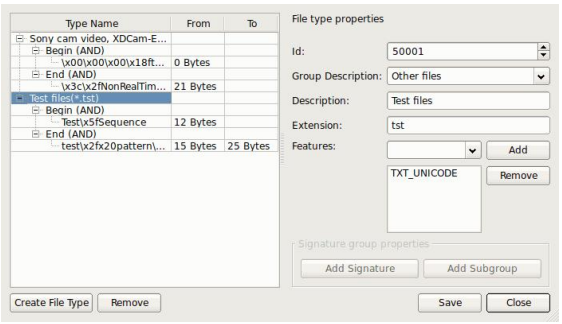
File signature properties

`Begin` `End`	Specifies from where the signature begins. If `End`, the offset is from the end of file to the first byte of the signature. That is, if the signature is two bytes long, the offset value should be `2`.
`AND` `OR`	Shows the order of the logical operation (union or intersection)
`From`	A decimal number specifying the leftmost possible offset for the file signature.
`To`	A decimal number specifying the rightmost possible offset for the file signature.

You may specify as many signatures as you need. Moreover, you may specify subgroups within a signature using the **Add Subgroup** button. The structure of such possible subgroups is described on the Customizing File Types-II help page.

> **The newly specified file type will appear on the** Edit User's File Types **dialog box and the** File Types **dialog box**

Edit User's File Types **dialog box**



2.2.3 Customizing File Types-I

The syntax of signature description is similar to that of the XML language. They are stored in the file specified on the **R-Studio** Main settings dialog box.

More advanced features are described in **Customizing File Types-II.**

Signature file example

```
<?xml version="1.0" encoding="utf-8"?>
  <FileTypeList>
    <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
      <Signature offset="3" count="1">Abc\x5c\x00\x04</Signature>
      <Signature offset="9" count="2">\x23\x01\xf4</Signature>
    </FileType>
  </FileTypeList>
```

File structure

File header

The file starts with a standard XML header

```
<?xml version="1.0" encoding="utf-8"?>
```

Section `FileTypeList`

```
<FileTypeList>
```

It requires a closing element `</FileTypeList>`.

Section `FileType`

This is a description of each file signature.

Attributes:

`id`	`<u32>`	Required	Digital file type identifier. Should be unique for each file type.	
`group`	`<string>`	Optional	Specifies a file type group in which found files will appear. You may specify either your own groups or those predefined on the File Types dialog box.	Default: `unknown`
`description`	`<string>`	Optional	Brief file description	Default: `null` (no description)

`features`	`NO_SCAN`
	`TXT_ANSI`
	`TXT_UNICODE`
		Optional	Additional properties of the file type. If you want to specify several properties, they should be separated by a space.	Default: `0`

`extension`	`<string>`	Optional	File extension.	Default: `null` (no extension)

File type properties flags

`NO_SCAN`	Not to be scanned for. If this flag is used, **R-Studio** will not search for such file type. Such files will be shown when sorting files by their extensions.
`TXT_ANSI`	The file can viewed as ANSI text. If this flag is specified, the file can be correctly represented as an ANSI text. When previewing, this file will be immediately sent to **Text/ hexadecimal editor**.
`TXT_UNICODE`	File can viewed as UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. When previewing, this file will be immediately sent to **Text/hexadecimal editor**.

This section can contain an unlimited number of the `Signature` elements.If there are several `Signature` elements, that means that all those signatures are simultaneously present in the file. Such signatures should have different `offset` attributes and they should not overlap.

Element `Signature`

The element contains a string value of the file signature consisting of ASCII characters and hex bytes in the `\xhh` format, where `hh` is a hexadecimal byte code. If there is not a hexadecimal number after `\x` , `\x` are treated as a part of the string section of the signature

Attributes:

`offset`	`<u16>`	Optional	Decimal offset for the signature	Default: `0`
`count`	`<u16>`	Optional	Decimal number specifying the number of signatures of the same length. Used when several signatures of the same length starting with the same offset can be present in a file.	Default: `1`

			In this case they should be sequentially written in the element, and the `size` attribute specifies the length of signature. `count*size` should be equal to the number of bytes in the element. If only one signature can be on this offset, `count` should be equal `"1"`, and `size` should be equal to the length (the number of bytes) of the signature.	
`size`	`<u16>`	Optional	Decimal number specifying the number of bytes in the signature.	Default: the number of bytes written in the element.
`from`	`begin` `end`	Optional	Specifies from where the `offset` is calculated. If `end`, the `offset` is from the end of file to the first byte of the signature. That is, if the signature is two bytes long, the `offset` value should be `2`.	Default: `begin`

Comments

```
<!-- Comment string -->
```

An XML standard string for a comment.

2.2.4 Customizing File Types-II

Currently **R-Studio** supports two versions of file type descriptions. Version 2 extends legacy Version 1 by adding variable signature offsets and `AND/OR` combination of several signatures in one file type. The version of file type description is specified by the version attribute of the `FileTypeList` section . Version 1 is the default option.

File structure

Elements common to Versions 1 and 2 of file type description

File header

The file starts with a standard XML header

```
<?xml version="1.0" encoding="utf-8"?>
```

Section `FileTypeList`

```
<FileTypeList>
```

Attributes:

`version`	`1.0` `2.0`	Optional	Version of file type description	Default: `1.0`

It requires a closing element `</FileTypeList>`.

Comments

```
<!-- Comment string -->
```

An XML-standard string for a comment.

Version 1 of file type description

Signature file example

```
<FileTypeList>
  <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
    <Signature offset="3" count="1">Abc\x5c\x00\x04</Signature>
    <Signature offset="9" count="2">\x23\x01\xf4</Signature>
  </FileType>
</FileTypeList>
```

Section `FileType`

This is a description of each file signature.

Attributes:

`id`	`<u32>`	Required	Digital file type identifier. Should be unique for each file type.	
`group`	`<string>`	Optional	Specifies a file type group in which found files will appear. You may specify either your own groups or those predefined on the File Types dialog box. See the table below.	Default: `unknown`
`description`	`<string>`	Optional	Brief file description	Default: `null` (no description)

`features`	`NO_SCAN`
	`TXT_ANSI`
	`TXT_UNICODE`
		Optional	Additional properties of the file type. If you want to specify several properties, they should be separated by a space.	Default: `0`

`extension`	`<string>`	Optional	File extension.	Default: `null` (no extension)

File type properties flags

`NO_SCAN`	Not to be scanned for. If this flag is used, **R-Studio** will not search for such file type. Such files will be shown when sorting files by their extensions.
`TXT_ANSI`	The file can be viewed as ANSI text. If this flag is specified, the file can be correctly represented as an ANSI text. When previewing, this file will be immediately sent to **Text/ hexadecimal editor**.
`TXT_UNICODE`	The file can be viewed as UNICODE text. If this flag is specified, the file can be correctly represented as a UNICODE text. When previewing, this file will be immediately sent to **Text/hexadecimal editor**.

List of predefined file type groups

Group	Name on the File Types dialog box.
`archive`	Archive Files
`graphics`	Graphics/Picture
`internet`	Internet-related files

multimedia	Multimedia Files
audio	Multimedia: Audio Files
video	Multimedia: Video Files
font	Font
document	Document
doc_database	Document: Database
doc_sheet	Document: Spreadsheet
exe	Executable/Library/DLL
unknown	Other file types

This section can contain an unlimited number of the Signature elements.If there are several Signature elements, that means that all those signatures are simultaneously present in the file. Such signatures should have different offset attributes and they should not overlap.

Element Signature

The element contains a string value of the file signature consisting of ASCII characters and hex bytes in the \xhh format, where hh is a hexadecimal byte code. If that is not a hexadecimal number after \x, \x are treated as a part of the string section of the signature

Attributes:

offset	<u16>	Optional	Decimal offset for the signature	Default: 0
count	<u16>	Optional	Decimal number specifying the number of signatures of the same length. Used when several signatures of the same length starting with the same offset can be present in a file. In this case they should be sequentially written in the element, and the size attribute specifies the length of signature. count*size should be equal to the number of bytes in the element. If only one signature can be on this offset, count should be equal to "1", and size should be equal to the length (the number of bytes) of the signature.	Default: 1
size	<u16>	Optional	Decimal number specifying the number of bytes in the signature.	Default: the number of bytes written in the element.
from	begin end	Optional	Specifies from where the offset is calculated. If end, the offset is from the end of file to the first byte of the signature. That is, if the signature is two bytes long, the offset value should be 2.	Default: begin

Version 2 of file type description

Signature file example

```
<?xml version="1.0" encoding="utf-8"?>
<FileTypeList version="2.0">
  <FileType id="5626" group="_Test" description="Test file" extension="tst">
    <Begin combine="and">
      <Signature from="0" to="20">ABC</Signature>
      <Signature offset="1">CDEFG</Signature>
      <AND>
        <Signature offset="0">DE</Signature>
        <Signature offset="0">RTD</Signature>
        <OR>
          <Signature offset="12">CP</Signature>
          <Signature offset="16">RTD</Signature>
        </OR>
      </AND>
    </Begin>
    <End combine="or">
      <Signature from="3" to="20">ABC</Signature>
      <Signature offset="5">CDEFG</Signature>
      <AND>
        <Signature offset="2">DE</Signature>
        <Signature offset="3">RTD</Signature>
        <OR>
          <Signature offset="12">CP</Signature>
          <Signature offset="16">RTD</Signature>
        </OR>
      </AND>
    </End>
  </FileType>
</FileTypeList>
```

Section `FileType`

This is a description of each file signature.

Attributes:

Similar to those in Version 1.

The section can contain one element `Begin` and one `End`. It should contain at least one of them.

Example

```
 <FileTypeList version=”2.0”>
    <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
      <Begin [attributes]>
        ...
      </Begin>
      <End [attributes]>
        ...
      </End>
    </FileType>
  </FileTypeList>
```

Sections `Begin` **and** `End`

Specify the positions of file type signatures in the file.

Attributes

combine	and or	Optional	Shows the order of the logical operation (union or intersection)	Default: and

These sections can contain one of several elements Signature. And one or several elements OR or AND. If there are several elements inside the section they are combined according to the attribute combine.

Example:

```
<FileTypeList version=”2.0”>
  <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
    <Begin combine="or">
      <Signature [attributes]> ... </Signature>
      ...
      <Signature [attributes]> ... </Signature>
      <AND>
        ...
      </AND>
      <OR>
        ...
      </OR>
    </Begin>
    <End>
      <OR>
        ...
      </OR>
      <Signature [attributes]> ... </Signature>
      ...
      <Signature [attributes]> ... </Signature>
    </End>
  </FileType>
</FileTypeList>
```

Sections AND and OR

These sections can contain one of several elements Signature. And one or several elements OR or AND. If there are several elements inside the section they are combined according to the section type (logical AND or OR).

Example:

```
<FileTypeList version=”2.0”>
  <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
    <Begin>
      <Signature [attributes]> ... </Signature>
      ...
      <Signature [attributes]> ... </Signature>
      <AND>
        <Signature [attributes]> ... </Signature>
        <OR>
          <Signature [attributes]> ... </Signature>
          <AND>
            <Signature [attributes]> ... </Signature>
            <Signature [attributes]> ... </Signature>
          </AND>
          <OR>
            <Signature [attributes]> ... </Signature>
            <Signature [attributes]> ... </Signature>
```

```
          </OR>
        </OR>
        <Signature [attributes]> ... </Signature>
      </AND>
    </Begin>
  </FileType>
</FileTypeList>
```

Element `Signature`

The element contains a string value of the file signature consisting of ASCII characters and hex bytes in the `\xhh` format, where `hh` is a hexadecimal byte code. If that is not a hexadecimal number after `\x`, `\x` are treated as a part of the string section of the signature

Attributes:

`offset`	`<u16>`	Optional	Decimal offset for the signature	Default: `0`
`from`	`<u16>`	Optional	Decimal number specifying the leftmost possible offset for the file signature. Ignored if the `offset` attribute is specified.	Default: undefined
`to`	`<u16>`	Optional	Decimal number specifying the rightmost possible offset for the file signature. Ignored if the `offset` attribute is specified.	Default: undefined
`size`	`<u16>`	Optional	Decimal number specifying the number of bytes in the signature.	Default: the number of bytes written in the element.

Example:

```
<FileTypeList version="2.0">
  <FileType id="2" group="archive" description="ARJ Archive" extension="arj">
    <Begin>
      <Signature offset="3">Abc\x5c\x00\x04</Signature>
      <Signature from="9" to="15">\x23\x01\xf4</Signature>
    </Begin>
  </FileType>
</FileTypeList>
```

2.2.5 Regions

Scanning large objects may take a long time. Sometimes, only a smaller area of a disk needs to be scanned or searched for files. Such area is called a *region*. A region can be created on any object in the **R-Studio**'s `Drives` panel.

Created regions can be scanned, and files on them can be recovered in the same way as from hard drives or logical disks.

Created regions can be deleted.

Note: R-Studio does not create anything real on the disk. Regions are virtual objects that do not affect actual data on the disk.

To create a *region*

1 **Select an object on the R-Studio's** Drives **panel and click the Create Region button**

Other ways to create the region

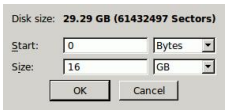
- Right-click the selected object and select **Create Region** on the context menu

or

- Select the object and select **Create Region** on the **Create** menu

2 **Specify required parameters on the** Create region **dialog box and click the Create button**

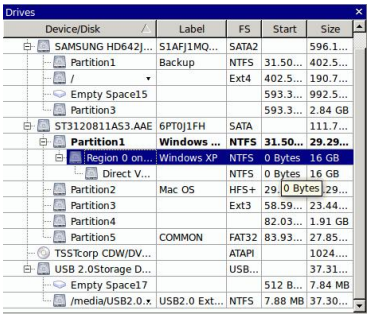
Create region **dialog box**



Region options

Disk size:	Shows size of the object where the region is to be created. The region cannot be larger than this size.
Start:	Start point of the region
Size:	Size of the region. Cannot be larger than Disk size.
Numbers in these fields can be in bytes or sectors. If no letters are after the numbers, **R-Studio** assumes the numbers are in bytes. See **Data Formats** for more details.	

> **A Region object will appear on the** Drives **panel.**



To remove a region

* **Select a Region on the R-Studio** Drives **panel and click the Remove button**, or

Right-click the selected region and select **Remove Region** on the context menu.

To change the size of a region

* **Right-click a Region on the R-Studio** Drives **panel, select Edit on the context menu, and enter a new size on the** Edit Region **dialog box.**

2.2.6 Exclusive Regions

Exclusive regions are areas on any object visible on the the **R-Studio**'s Drives panel that are excluded from disk operations. **R-Studio** never tries to read/write data from/to such area. Exclusive regions are necessary when, for example, there are areas with bad sectors on a hard drive, and it is necessary to avoid any disk operations with such areas to not inflict further damage to such drive and to speed work with it.

Note: R-Studio does not create anything real on the disk. Exclusive regions are virtual objects that do not affect

actual data on the disk.

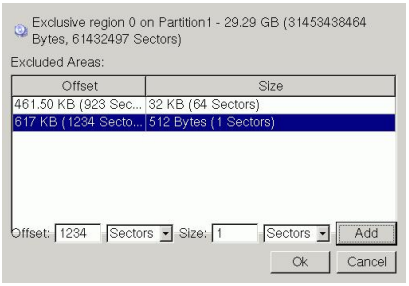
To create an *exclusive region*

1 **Right-click an object on the R-Studio's** Drives **panel and select Create Exclusive Region on the context menu,** or

Select the object and select **Create Exclusive Region** on the **Create** menu

2 **Specify required parameters on the** Create Exclusive Region **dialog box and click the Add button**

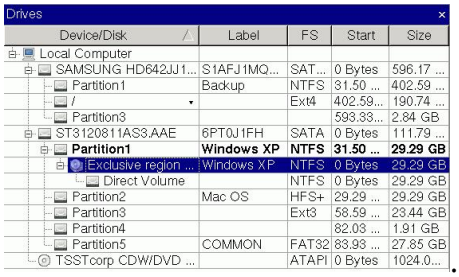
Create exclusive region **dialog box**



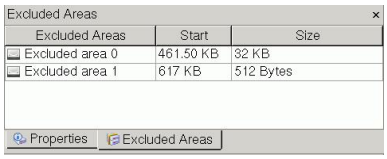
Exclusive Region options

Offset:	Start point of the exclusive region
Size:	Size of the exclusive region. Cannot be larger than Disk size.
Numbers in these fields can be in bytes or sectors. If no letters are after the numbers, **R-Studio** assumes the numbers are in bytes. See **Data Formats** for more details.	

> **An Exclusive Region object will appear on the** Drives **panel.**



Its properties can be seen on the Excluded Areas tab.



To remove an exclusive region

* **Select an Exclusive Region on the R-Studio** Drives **panel and click the Remove button, or**

Right-click the selected region and select **Remove Region** on the context menu.

To change the size of an exclusive region

* **Right-click an Exclusive Region on the R-Studio** Drives **panel, select Edit on the context menu, and add/remove excluded areas on the Edit**e Exclusive Region **dialog box.**

You may remove an excluded area by right-clicking it and selecting **Remove** on the context menu.

2.2.7 Images

An *image* is an exact, byte by byte, copy of any object on the Drives panel. When created, images can be processed like their original objects.

Images are very useful if there is a risk of total data loss due to hardware malfunction. If bad blocks are constantly appearing on a hard drive, you must immediately create an image of this drive. All data search, scan and restoring can be done from this image.

While creating images, **R-Studio** can simultaneously perform disk scan and save scan information to lessen time necessary to process the disk.

The image can be saved on the remote computer if it is created via network. **DeepSpar Disk Imager™**

To create an *image*,

1 **Select an object on the R-Studio's Drives panel and click the Create Image button**

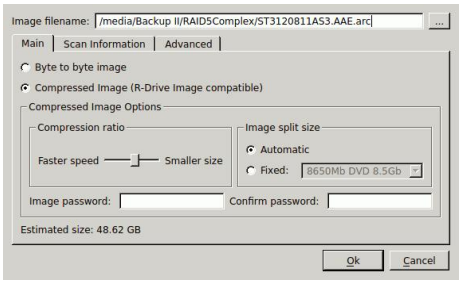
- ***Other ways to create the image***
  - Select the object and select **Create Image** on the **Drive** menu

  or
  - Right-click the selected object and select **Create Image File** on the context menu

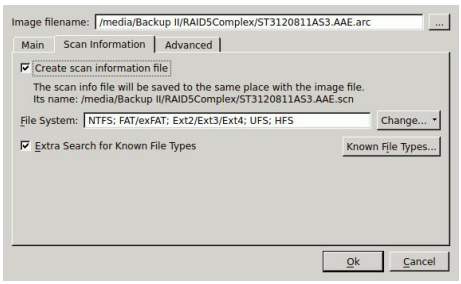
2 **Specify image options, a file name, and destination for the *image* on the Create Image dialog box**

Note: To store an image file, you need a free space equal to at least the object size.

Create Image (Main) **dialog box**



Create Image (Scan Information) **dialog box**



Create Image (Advanced) **dialog box**

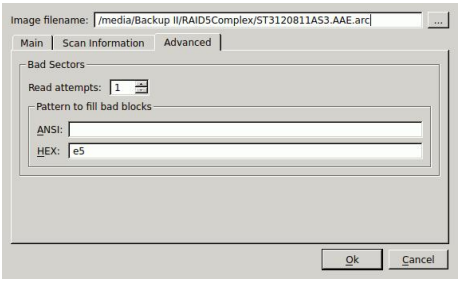
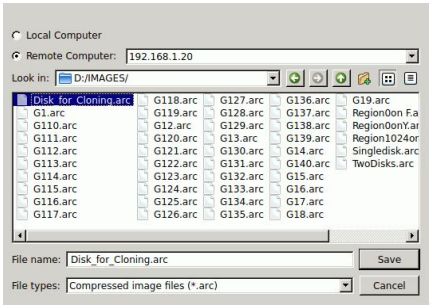


Image Options

Image name	Specifies the name and path for the image file
Byte to byte image	If this option is selected, **R-Studio** will create a simple exact copy of the object. This image format is compatible with the previous versions of **R-Studio**.
Compressed image (R-Drive Image compatible)	If this option is selected, **R-Studio** will create an image file which can be compressed, split into several parts, and password-protected. This image file is fully compatible with the images created by **R-Drive Image**, but incompatible with the previous versions of **R-Studio**.
Image compression ratio	You may compress the data in the image to save space. Active only if the Compressed image (R-Drive Image compatible) is selected.
Estimated size	Shows the estimated size of the image file. An actual image size depends on how much empty space is on the selected partition and what file types are there. Active only if the Compressed image (R-Drive Image compatible) is selected.
Image split size	You may set this option to Automatic and let the OS decide how to split the image file. This mostly depends on the file system on the destination disk. You may also either explicitly specify the split size, or choose a preset for various devices with removable storage. Select Fixed size for that. Active only if the Compressed image (R-Drive Image compatible) is selected.
Password	You may protect your image file with a password. **Note:** This feature provides a relatively moderate protection against conventional unauthorized access. Active only if the Compressed image (R-Drive Image compatible) is selected.
Create scan information file	If this option is selected, **R-Studio** will perform disk scan simultaneously with image creation. See the **Disk Scan** help page to learn scan options.
Read attempts	Specifies a value for I/O Tries, or how many times **R-Studio** will try to read a bad sector. **R-Studio** treats bad sectors in the following way: It reads a certain part of disk (predefined by Windows) and • If Default read attempts is set to 0, the entire part with bad sectors will be filled with the specified pattern. • If Default read attempts is set to a non-zero value, **R-Studio** reads again that part sector by sector, repeating the attempts the specified number of times. If **R-Studio** still cannot read a bad sector, it fills the sectors with the specified pattern. In this case only the bad sectors will be filled with the pattern, but that extremely slows the disk read process. For example, if you set Default read attempts to 1, a bad sector will be read 2

	times.
Pattern to fill bad blocks	Specifies a pattern **R-Studio** will use to fill bad sectors in this image. You may specify the pattern either in the ANSI or Hex data format. **Note: R-Studio** will never ever try to write anything on the disk from which data is to recover or an image is to create. This pattern fills bad sectors only in the image.

If a remote computer is connected for **Data Recovery over Network**, the Save Image File dialog box will appear when you select a place to store the image. You may save it to the local or remote computer.



> **R-Studio will start creating the image, the** Progress **message showing the progress.**

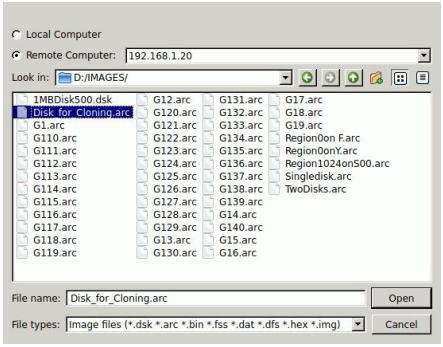
To process an already created *Image*, the image file should be opened.

To open an image

1 **Click the Open Image button**, or

Select **Open Image File** on the **Drive** menu

If a remote computer is connected for **Data Recovery over Network**, the Open Image File dialog box will appear when you select a place to load the image file from. You may load it from the local or remote computer.

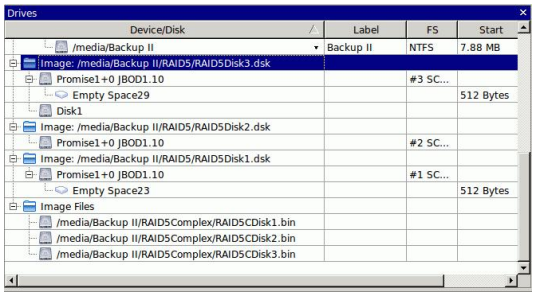


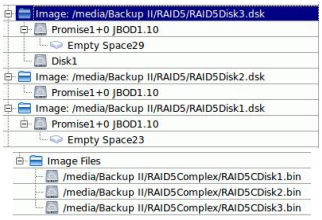
2 **Select the required image file**

> **An *Image* object will appear on the** Drives **panel**

Depending whether this is a byte-by-byte or compressed (**R-Drive Image** compatible), its appearance in the Drives panels is different.

You may perform all data search, scan, and recovery from this image as it were a regular drive/disk object.





Compressed (**R-Drive Image** compatible) images

Byte-to-byte images

2.2.8 Object Copy

You may copy any object in the Drives panel to any other object, if there is enough space on the target one. Before **Copy object to...** becomes enabled on the **Create** menu, you need to enable writing.

To enable writing,

1 **On the R-Studio main panel, select the Tools menu, then Settings, and select Enable Write on the** Settings **dialog box.**

> **The Copy object to... will be enabled on the Create menu.**
Now objects can be copied.

Depending on the objects to copy and your tasks, you may do:

Binary (byte to byte copy)

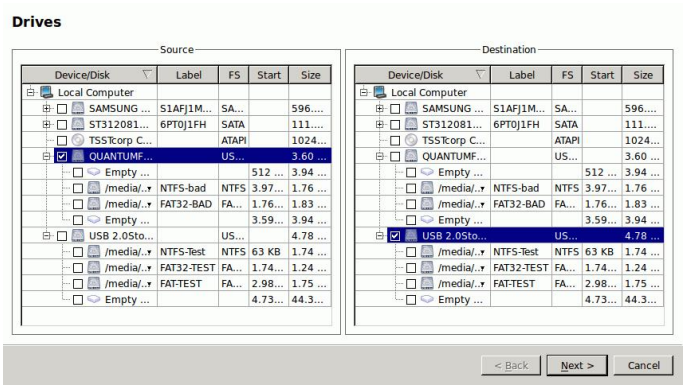
An exact copy of the source object (or a part thereof) to the destination device (from its beginning or a specified offset). Any object may be copied to any object this way.

To perform a binary copy of an object,

1 **Select Copy object to... on the Create menu**

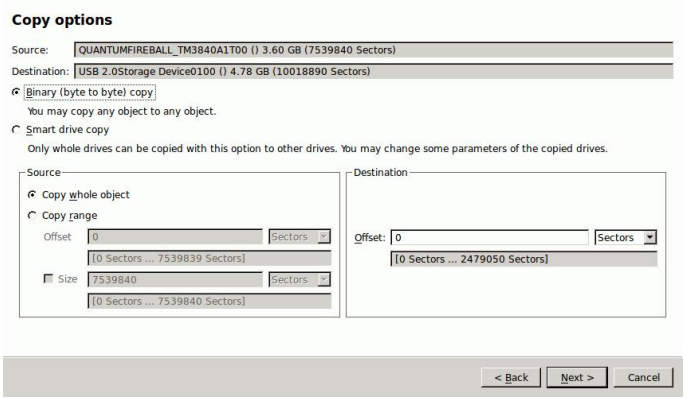
2 **Select a source and destination objects on the** Drives Copy Wizard **panel and click the Next button**

Drives Copy Wizard



3 Select Binary (byte to byte) copy **on the** Copy Options **dialog box, specify copy options, and click the Next button**

Copy options **dialog box**

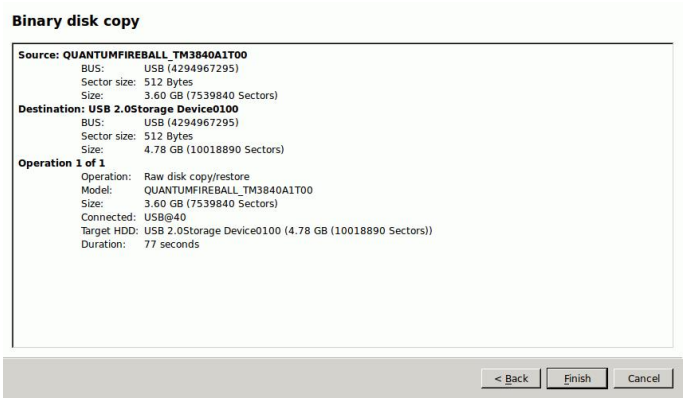

Copy options
Source: QUANTUMFIREBALL_TM3840A1T00 () 3.60 GB (7539840 Sectors)
Destination: USB 2.0Storage Device0100 () 4.78 GB (10018890 Sectors)
Binary (byte to byte) copy
You may copy any object to any object.
Smart drive copy
Only whole drives can be copied with this option to other drives. You may change some parameters of the copied drives.
Source
Copy whole object
Copy range
Offset 0 Sectors
[0 Sectors ... 7539839 Sectors]
Size 7539840 Sectors
[0 Sectors ... 7539840 Sectors]
Destination
Offset: 0 Sectors
[0 Sectors ... 2479050 Sectors]
< Back
Next >
Cancel

Copy options

Source	
Copy whole object	Select this option if you want to copy the entire source object to the destination one
Copy range	Select this option if you want to copy a part of the source object
Offset	Specify the offset from which the source object data will be copied to the destination object
Size	Specify the size of the source object data which will be copied to the destination object
Destination	
Offset	Specify the offset on the destination object to which the source object data will be copied

3 View the copy task settings on the Drives Copy Wizard **and click the Finish button**

Drives Copy Wizard



or click the **<Back** button to edit the copy parameters

> R-Studio will start copying data from the source object to the destination one.

Smart partition copy

Only partitions can be copied with this option to other partitions or empty spaces. You may change some

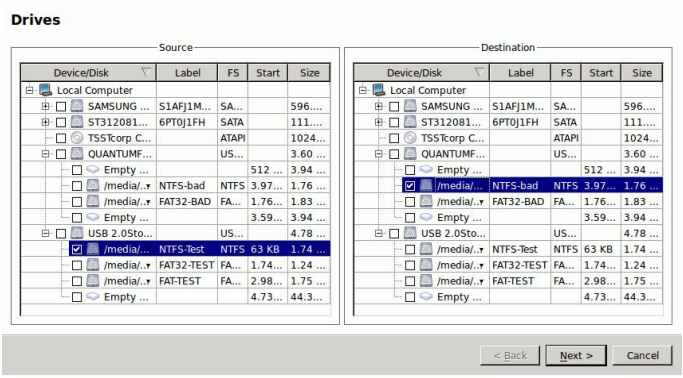
parameters of the the copied partition(s) on the destination drive.

To perform a smart partition copy of a partition,

1 **Select Copy object to... on the Create menu**

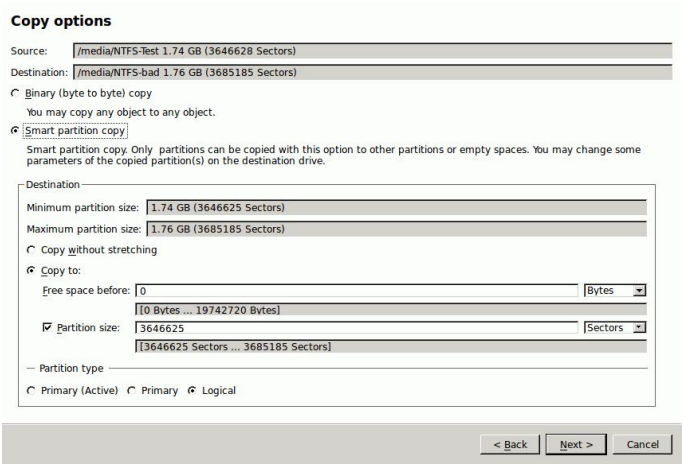
2 **Select source and destination partitions on the** Drives Copy Wizard **panel and click the Next button**

Drives Copy Wizard



3 **Select** Smart partition copy **on the** Copy Options **panel, specify copy options, and click the Next button**

Copy options **dialog box**

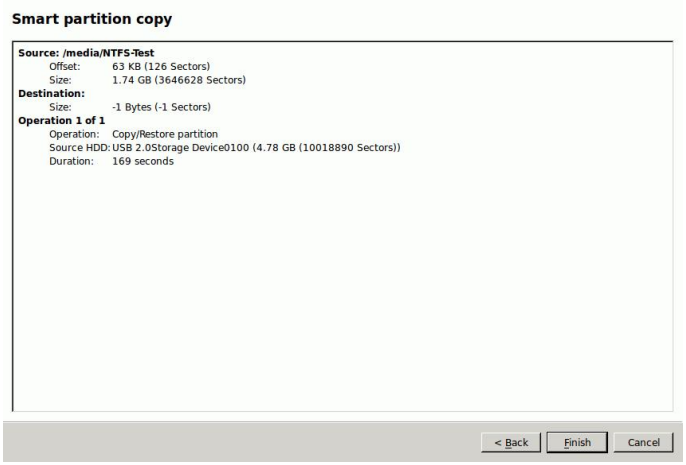


Copy options

Destination	
Copy without stretching	Select this option if you want to copy the partition exactly to the destination place
Copy to:	Select this option if you want to change some parameters of the copied partition on the destination place
Free space before	Specify how much space will be left empty before the start of the copied partition
Partition size	Select this option and specify the new size of the copied partition
Partition type Primary (Active)/ Primary/Logical	Specify the type of the partition to be copied. Do not change this setting unless you have serious reasons to do so.

3 View the copy task settings on the Drives Copy Wizard **and click the Finish button**

Drives Copy Wizard



or click the **<Back** button to edit the copy parameters

> R-Studio will start copying data from the source partition to the destination place.

Smart drive copy

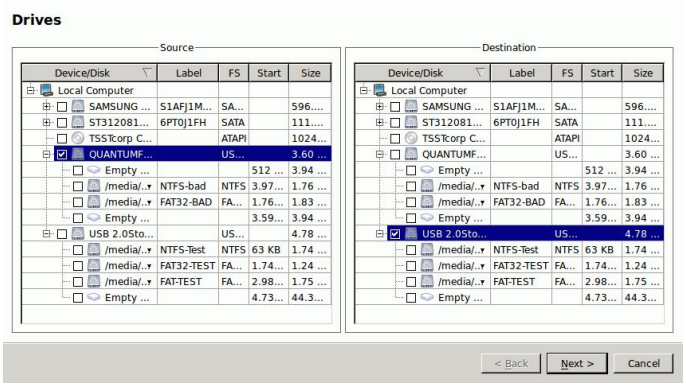
Only whole drives can be copied with this option to other drives. You may change some parameters of the copied drives.

To perform a smart drive copy of a hard drive,

1 Select Copy object to... on the Create menu

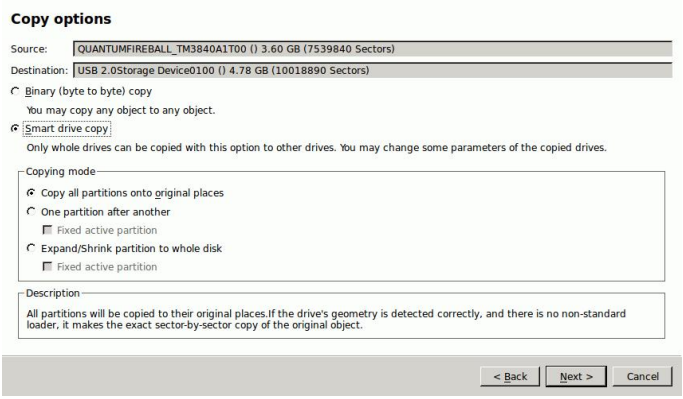
2 Select a source and destination hard drives on the Drives Copy Wizard **panel and click the Next button**

Drives Copy Wizard



3 Select Smart drive copy **on the** Copy Options **panel, specify copy options, and click the Next button**

Copy options **dialog box**

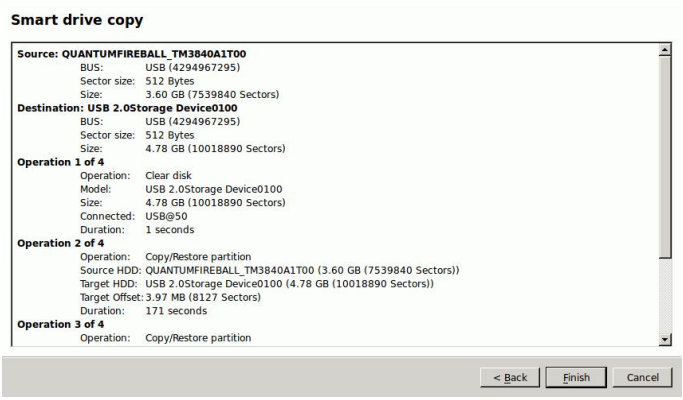

Copy options
Source:
QUANTUMFIREBALL_TM3840A1T00 () 3.60 GB (7539840 Sectors)
Destination:
USB 2.0Storage Device0100 () 4.78 GB (10018890 Sectors)
Binary (byte to byte) copy
You may copy any object to any object.
Smart drive copy
Only whole drives can be copied with this option to other drives. You may change some parameters of the copied drives.
Copying mode
Copy all partitions onto original places
One partition after another
Fixed active partition
Expand/Shrink partition to whole disk
Fixed active partition
Description
All partitions will be copied to their original places.If the drive's geometry is detected correctly, and there is no non-standard loader, it makes the exact sector-by-sector copy of the original object.
< Back
Next >
Cancel

Copy options

Copying mode	
Copy all partitions onto original places	Select this option if you want to copy all partitions to their original places.
One partition after another	Select this option if you want to copy the partitions one after another preserving their space. If there is empty space between the partitions, it will be omitted. Otherwise it is similar to Copy all partitions onto original places. If Fixed active partition is selected, the original offset/size of the active partition will be preserved (in case the loader has links to it).
Expand/Shrink partition to whole disk	Specify this option if you want to proportionally expand/shrink the selected partitions to occupy the entire target drive. If Fixed active partition is selected, the original offset/size of the active partition will be preserved (in case the loader has links to it).

3 View the copy task settings on the Drives Copy Wizard **and click the Finish button**

Drives Copy Wizard



or click the **<Back** button to edit the copy parameters

> R-Studio will start copying data from the source hard drive to the destination one.

2.3 Mass File Recovery

Recovery of multiple files

If you need to recover multiple files you may do it through the following steps:

1 **Find and mark all the necessary files**
Go to the Find and Mark Multiple Files topic for more information

2 **Recover all marked files in a single file recovery step**
Go to the Recover Multiple Files for more information

Memory considerations

R-Studio stores information about found files in computer memory. If there are too many files, **R-Studio** may run out of it. To avoid this, you have two options:

Recover all files

If you want to recover data from an entire file system object (a logical disk, partition, partition image, etc.), you may use the **Recover All Files** command from the **Drive** or context menu. Right click the object in the Drives panel to access the context menu. A Recover dialog box will appear. Select required restore settings, including file mask. This command restores unlimited number of files without memory restrictions.

View file information in steps

As soon as **R-Studio** nearly runs out of memory, a Too many files... message appears. You may temporally stop file listing and browse through found files. Then you can resume file listing. You also may skip this file section and continue file listing.

In all cases, **R-Studio** keeps information about the entire file structure.

- **Find and Mark Multiple Files**
- **Recover Multiple Files**

2.3.1 Find and Mark Multiple Files

If you need to find and mark many files at once, you may do that in the following ways:

By sorting them by their extensions or creation/modification/accessed time

To sort files by their extensions or creation/modification/accessed time,

* **On the** Folders/Files **panel select the tab**

Extensions	to sort the files by their extensions
Creation Time	to sort the files by their creation time
Modification Time	to sort the files by their modification time
Accessed Time	to sort the files by their accessed time

Other ways to sort files by their extensions or creation/modification/accessed time

- Select the disk on Drives panel, select **Open Drive Files Sorted By** on the **Drive** menu, and select the respective option,

or

- On the Drives panel, right-click the disk and select **Open Drive Files Sorted By** on the context menu and

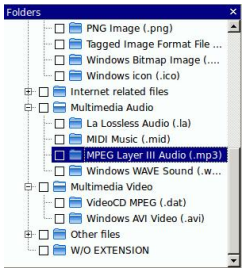
select the respective option,

or

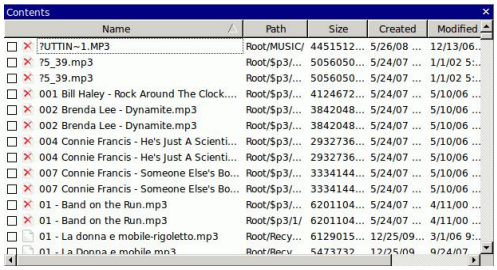
- On the Folders panel, right-click the disk letter and select **Show Files Sorted By** on the context menu and select the respective option,

> **R-Studio will show the sorted files in the** Folders **and** Content **panels, showing the path to each file:**

Folders panel for files sorted by their extensions



Content panel with files/folders sorted by their extensions



To return to the conventional view,

* **On the** Drives **panel, right-click the logical disk, select Open Drive Files Sorted By on the context menu, and select Real File System Structure,**

or

On the Folders panel, select **Show Files Sorted By** on the **Drive** menu and select **Real File System Structure**

or

Click the **Real** tab

By finding and marking multiple files using the Find / Mark *dialog box*

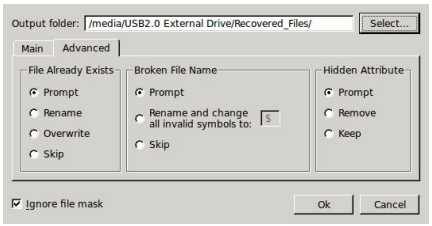
You may find and mark all the files on the entire disk by using Mark matched files in the Find/Mark mode option. You may specify all the necessary search options and mark all the found files. Please note that each find and mark/unmark operation is independent from previous ones. That is, if a file matches the search criteria, it will be marked/unmarked regardless of its previous marked/unmarked state.

For example, if you first mark all `doc` files, and then all `txt` files, all `doc` files remain marked, too. If you then decide to unmark all files smaller than 2 kB, all `doc` and `txt` files will stay marked except those that less than 2 kB.

2.3.2 Recover Multiple Files

If **R-Studio** while recovering files encounters either an already existing file or file with a broken name, normally it will stop working and ask you what to do with the file. If you recover multiple files, that may require you answer a lot of the same questions. You may use Mass File Recovery Options on the Recover dialog box to instruct **R-Studio** what to do in those cases for all files.

Recover (Advanced) **dialog box**



Advanced file recovery options

File Already Exists	These options instruct **R-Studio** what to do if there already exists a file with the same name.
Prompt	If this option is selected, **R-Studio** asks the user what to do for each such file. It stops file recovery until it receives the answer.
Rename	If this option is selected, **R-Studio** adds a File ID to the file name. If a file already exists with the same name and that file ID, a number will be added to th file name and file ID.
Overwrite	If this option is selected, **R-Studio** overwrites the old file with the new one.
Skip	If this option is selected, **R-Studio** skips all new files with the same name.
Broken File Name	These options instruct **R-Studio** what to do if a file to be recovered appears to have an invalid name.
Prompt	If this option is selected, **R-Studio** shows the standard Broken File Name dialog box for each file with a broken file name. It stops file recovery until it receives the answer.
Rename and change all invalid symbols to:	If this option is selected, **R-Studio** changes all invalid characters to the character specified.
Skip	If this option is selected, **R-Studio** skips all files with broken file names.
Hidden Attribute	These options instruct **R-Studio** what to do if a file to be recovered appears to have the Hidden attribute.
Prompt	If this option is selected, **R-Studio** asks the user what to do with the attribute. It stops file recovery until it receives the answer.
Remove	If this option is selected, **R-Studio** removes the Hidden attribute from all files.
Keep	If this option is selected, **R-Studio** keeps the Hidden attribute for all files.

2.3.3 File Recovery Lists

You may create a file containing a list of files and folder found on a disk/partition. Then such file may be manually edited to specify files to recover and then loaded back into **R-Studio**. **R-Studio** will automatically mark the files in this list for recovery. Such file lists recovery are very useful, for example, when it is necessary to have such file

lists approved for recovery by someone else who is far away from the computer where **R-Studio** is running.
You may create file recovery lists for the entire disk or for specific folders. Moreover, you may create a file recovery list for all files within the disk/folder, or for marked files/folders only.

Creating a file recovery list

To create a file recovery list

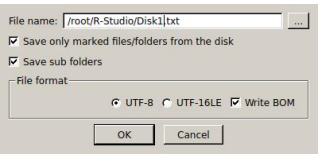
1 **For an entire disk, Select Save File Names to File on the File menu, or**

Right-click the uppermost folder (higher than **Root**, usually the letter or the name of the disk) and select **Save File Names to File** on the context menu.

For a specific folder, right-click the folder and select Save File Names to File on the context menu.

2 **Specify the place to save the file recovery list and other necessary options on the** Save File Names **dialog box**

Save File Names **dialog box**



Save File Names options

File name:	Specifies file name of the file recovery list.
Save only marked files/ folders from…	If this option is selected, only marked files will be included into the file recovery list.
Save sub folders	If this option is selected, sub folders and their files will also be included into the file recovery list.
File format:	Specifies the file format in which localized file/folder names will be saved, You may select either the UTF-8 or UTF-16 codepage. Also you may write a special BOM header to the file which helps some text editors to understand which codepage is used.

Structure of a file recovery list file created by R-Studio

An example of such a file:

```
:# PathDelim = \
Files to Delete\
Files to Delete\File_2.pst
Files to Delete\Outlook_recovered_by_R_Mail.pst
Files to Recover\
Files to Recover\$est2.arc
Files to Recover\$est4.arc
Files to Recover\$est5.arc
Files to Recover\$est6.arc
Files to Recover\$est7.arc
Files to Recover\~$pe Test 2.doc
Files to Recover\Outlook.pst
Files to Recover\Outlook_recovered_by_R_Mail.pst
Files to Recover\Picture 113.jpg
Files to Recover\Picture 149.jpg
```

```
Files to Recover\Picture 237.jpg
Files to Recover\test1.arc
Files to Recover\test3.arc
Files to Recover\Wipe Test 1.doc
Files to Recover\Wipe Test 2.doc
Files to Recover\Wipe Test 3.doc
Files to Recover\Wipe Test 4.doc
Files to Recover\Wipe Test 5.doc
Files to Recover\Wipe Test 6.doc
```

`:# PathDelim = \` is a parameter specifying a character for path delimitation. You may also specify a Unix-stile delimiter `/` .

```
:# PathDelim = \
:# PathDelim = /
```

In addition, the files from the virtual folders `Metafiles`, `ExtraFoundFiles`, etc..., have the following designations:

Metafiles:	`///m/[localized_name_for_Metafiles]/`
Extra Found Files:	`///e/[localized_name_for_ExtraFoundFiles]/`
Other Virtual Folders:	`///v/[localized_name_for_OtherVirtualFolders]/`

For the English language, that will look like:

```
///m/Metafiles\
///m/Metafiles\$BOOT
///m/Metafiles\$FAT
///m/Metafiles\$FAT0
///m/Metafiles\$FAT1
```

Editing the file recovery list file

All files included into a file recovery list will be marked when the file will be loaded into **R-Studio**. So, if you have some files in the file recovery list that doesn't need to be recovered, just delete them from the list. In addition, you may use the following marks to specify some options

`:+` Mark all files and subfolders within the folder.

`:*` Mark only files within the folder.

`:-` Unmark the file or all files and subfolders within the folder.

`:=` Unmark the file or only files within the folder.

processes records in the file consequently. That is, if there are the following lines in the file,

```
:+Files to Delete\
:-Files to Delete\File_2.pst
```

the file `File_2.pst` won't be marked for recovery, while for the lines

```
:-Files to Delete\File_2.pst
:+Files to Delete\
```

file `File_2.pst` will be.

Please note that records for folders without any marks don't affect the file marking. Thus, for the lines

```
:-Files to Delete\File_2.pst
Files to Delete\
```

file `File_2.pst` will not be marked.

Loading the file recovery list

To load a file recovery list into R-Studio,

* **Select Load File Names from File and Mark on the File menu and select the file.**

> **R-Studio will load the file and mark the files accordingly.**

2.4 Volume Sets and RAIDs

R-Studio detects and processes valid hardware volume sets and RAIDs like regular drives/volumes.

R-Studio can analyze and recover data from software volume sets and RAIDs. If a software volume set or RAID is present in your system, **R-Studio** detects it, and a ***Volume sets and RAIDs*** object appears on the Drives panel. This object can be searched for files, scanned, and files found on it can be recovered the same way as from normal drives/volumes.

If, due to hardware failure, a hardware volume set or RAID cannot be accessed, or due to data loss your system does not recognize a software volume set or RAID, and you know what hard drives were in it, you may create a ***Virtual volume set*** or ***RAID*** and process it like a real software volume set or RAID or hardware volume set or RAID.

You may find more information on RAID data structure in Wikipedia.

You may turn numerical indexes for objects to distinguish them better while creating virtual RAIDs.

- **Volume Sets, Stripe Sets, and Mirrors**
- **Basic RAID 4 and RAID 5 Operations**
- **Working with RAID 6 Presets**
- **Working with RAID6 (Double Xor)**
- **Working with RAIDs with Parity Delays**
- **Working with Advanced RAID Layouts**
- **Nested and Non-Standard RAID Levels**
- **Various Disk and Volume Managers**
- **Finding RAID Parameters**
- **Checking RAID Consistency**
- **Syntax of a Description File for RAID Configurations**
- **Description Files for RAID Configurations**
- **Reverse RAIDs**

Managing your own RAID layouts

To save your own RAID layout in the presets

1 **Click the More... button on** Parents **tab and select Save on the context menu.**

2 **Specify the name for the configuration on the** Preset name **dialog box.**

Preset name **dialog box**

> **The new RAID configuration will be saved in the presets**

The configurations are stored in the user's RAID layout file. The path and name for this file is specified on the R-Studio Settings dialog box. If no file is specified, **R-Studio** will ask you to enter the name.

To load your RAID configuration

1 **Click the More... button on** Parents **tab and select the preset you want to load**

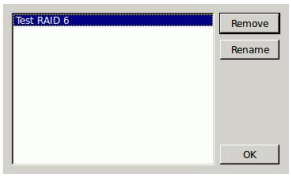
> **The new RAID configuration will be loaded**

To edit your own RAID configuration

1 **Click the More... button on** Parents **tab and select Edit... on the context menu**

2 **Select the required configuration on the** Edit Block RAID Layout Presets **dialog box.**

Edit Block RAID Layout Presets **dialog box**



3 **Edit the parameters of the configuration and save it**

> **The new configuration parameters will be saved.**

Turning Disks On-Line and Off-Line on-the-fly

You may turn the objects in the virtual RAID or volume set on-line and off-line by selecting/clearing the checkbox on the Parents tab. It may be useful, for example, if you need to see which disk is non-actual in a RAID 5.

Actually, when you turn an object off-line, **R-Studio** substitutes it with a ***Missing Disk*** or ***Empty Space*** object.

Missing Disks and Empty Space

If one partition from a hardware volume set or RAID or software volume set or RAID is absent, due to hardware failure, for example, you need to add a virtual missing disk or empty space in order to correctly re-construct the hardware volume set or RAID or software volume set or RAID structure. The missing disk/empty space should be placed in the same place as the missing partition.

Note: R-Studio does not write anything real on the disk. Missing disks/empty space are virtual objects that do not affect actual data on the drive.

To add a *Missing disk/Empty space* object

1 **Select a *Volume sets and RAIDs* object on the R-Studio's Drives panel**

2 **Right-click in the** Parents **tab in the right pane and select Add Missing Disk or Add Empty Space on the context menu or select Add Missing Disk or Add Empty Space on the Create menu. Which object type is necessary, R-Studio decides automatically.**

For the **Empty space** object, Specify its size on the Add Empty Space dialog box.

Add Empty Space **dialog box**

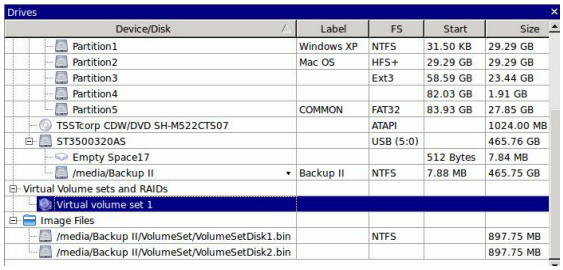
> **A *Missing Disk* or Empty Space object will appear in the** Parents **tab**

2.4.1 Volume Sets, Stripe Sets, and Mirrors

To create a Volume set object

1 **Click the Create Virtual RAID button and select Create Virtual Volume set**
or select the **Create Virtual Volume set** on the **Create** menu

> **A Virtual Volume set object will appear on the** Drives **panel**



2 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

3 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

Other ways to add objects

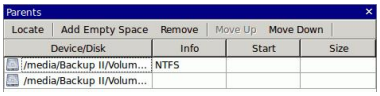
- Right-click the Parents tab and select the required partition from the context menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

Or right-click the Parents tab and select the required partition from the context menu.

Note: Objects should be placed in the same order as they were in the original volume set. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

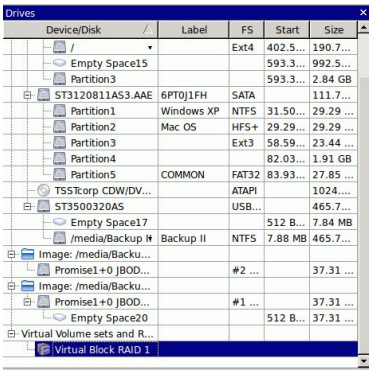


> **The *Virtual volume set or RAIDs* object can now be processed like regular drives/volumes**
If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

To create a Stripe set object (RAID 0)

1 **Click the Create Virtual RAID button and select Create Virtual Block RAID**
or select the **Create Virtual Block RAID** on the **Create** menu

> **A Virtual Block RAID object will appear on the** Drives **panel**



2 Select RAID 0 (Stripe set) on the RAID type

3 Drag the required partitions from the Drives **panel to the** Parents **tab**

Or right-click the Parents tab and select the required partition from the context menu.

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original volume set. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

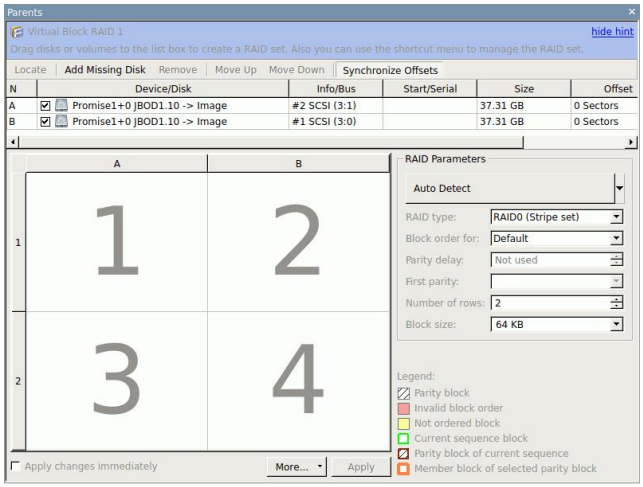
Object control buttons

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The Block size and Offset (in sectors) parameters must be set the same as for the original volume set.

You also need to specify Block order. You may select it on the Blocks order drop-down or context menu.

If the those parameters are not correct, data on the parents will not be damaged, but they cannot be recovered.



> **The Virtual Block RAID object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

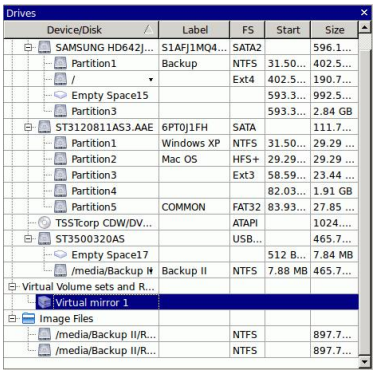
The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

To create a Mirror set object (RAID 1)

1 Click the Create Virtual RAID button and select Create Virtual Mirror

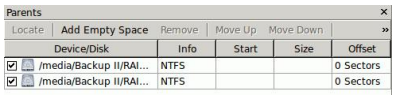
or select the **Create Virtual Mirror** on the **Create** menu

> **A Virtual Mirror object will appear on the** Drives **panel**



2 Drag the required partitions from the Drives **panel to the** Parents **tab**

Or right-click the Parents tab and select the required partition from the context menu.



> **The Virtual Mirror object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

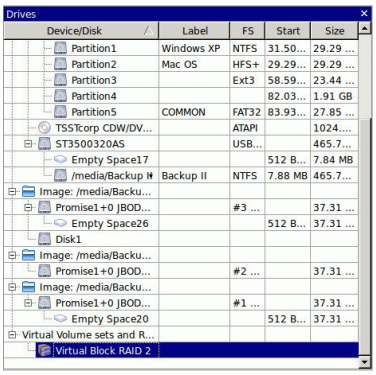
2.4.2 Basic RAID 4 and RAID 5 Operations

RAID 4 and RAID 5 are much similar. You may create and edit a RAID 4 object the same way as a RAID 5 one.

To create a RAID 5 object

1 **Click the Create Virtual RAID button and select Create Virtual Block RAID**
or select the **Create Virtual Block RAID** on the **Create** menu

> **A Virtual Block RAID object will appear on the** Drives **panel**



2 **Select RAID 5 on the RAID type**

3 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

3 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

Other ways to add objects

- Right-click the Parents tab and select the required partition from the context menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 5. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Object control buttons

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

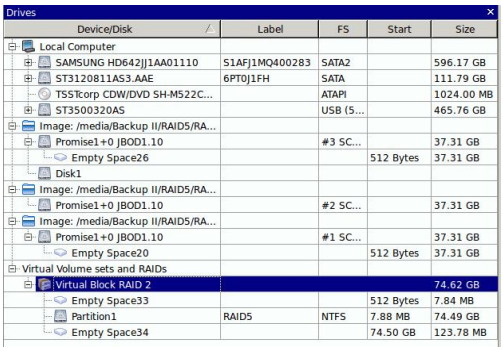
The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 5.

You also need to specify Block order for virtual RAID 5. You may select it on the Block order drop-down or context menu.

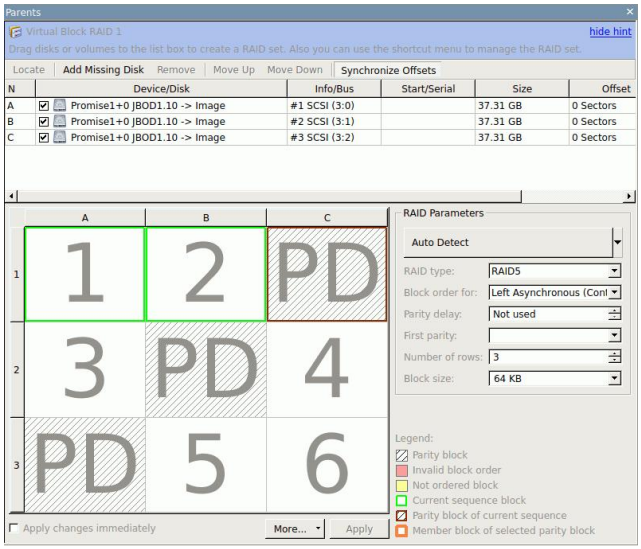
If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 5 cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 5. Find a file and preview it. If the file appears correct, you have created a correct RAID 5 layout.

If your RAID 5 has an unusual configuration, you may create them manually. See **Working with Advanced RAID 5 Layouts** for details.



Parents **tab**



> **The *RAID 5* object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

Creating and saving your own RAID 5 configuration

You may create and save your own RAID configurations for non-standard RAIDs. You may specify Offset, Block order/size and Row count. See **Working with Advanced RAID 5 Layouts** for details.

2.4.3 Working with RAID 6 Presets

R-Studio allows you to create and process RAID 6 layouts. You may use either presets for several RAID 6 layouts, or use your own custom ones.

R-Studio provides presets for the following RAID 6 layouts:

Reed-Solomon

Left Synchronous (standard),	Left Asynchronous (continuous),	Right Synchronous	Right Asynchronous

In addition you may create your own RAID 6 configurations.

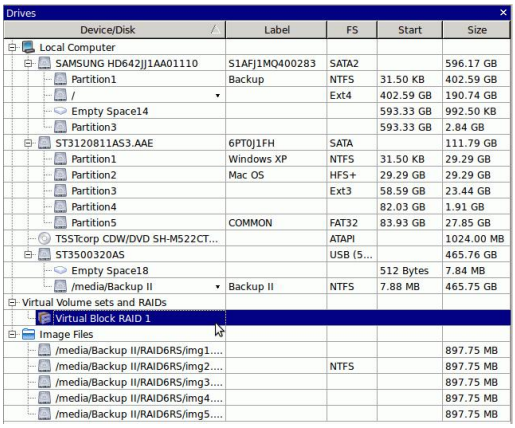
Creating a RAID 6 object from a preset:

We will use the Reed-Solomon (Left Synchronous (standard)) preset as an example.

To create a RAID 6 object

1 **Click the Create Virtual RAID button and select Create Virtual Block RAID**
or select the **Create Virtual Block RAID** on the **Create** menu

> **A Virtual Block RAID object will appear on the** Drives **panel**


Drives
Device/Disk
Label
FS
Start
Size
Local Computer
SAMSUNG HD642JJ1AA01110 S1AFJ1MQ400283 SATA2 596.17 GB
Partition1 Backup NTFS 31.50 KB 402.59 GB
/ Ext4 402.59 GB 190.74 GB
Empty Space14 593.33 GB 992.50 KB
Partition3 593.33 GB 2.84 GB
ST3120811AS3.AAE 6PT0J1FH SATA 111.79 GB
Partition1 Windows XP NTFS 31.50 KB 29.29 GB
Partition2 Mac OS HFS+ 29.29 GB 29.29 GB
Partition3 Ext3 58.59 GB 23.44 GB
Partition4 82.03 GB 1.91 GB
Partition5 COMMON FAT32 83.93 GB 27.85 GB
TSSTcorp CDW/DVD SH-M522CT... ATAPI 1024.00 MB
ST3500320AS USB (5... 465.76 GB
Empty Space18 512 Bytes 7.84 MB
/media/Backup II Backup II NTFS 7.88 MB 465.75 GB
Virtual Volume sets and RAIDs
Virtual Block RAID 1
Image Files
/media/Backup II/RAID6RS/img1.... 897.75 MB
/media/Backup II/RAID6RS/img2.... NTFS 897.75 MB
/media/Backup II/RAID6RS/img3.... 897.75 MB
/media/Backup II/RAID6RS/img4.... 897.75 MB
/media/Backup II/RAID6RS/img5.... 897.75 MB

2 **Select RAID 6/Reed-Solomon on the RAID type**

3 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

3 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

Other ways to add objects

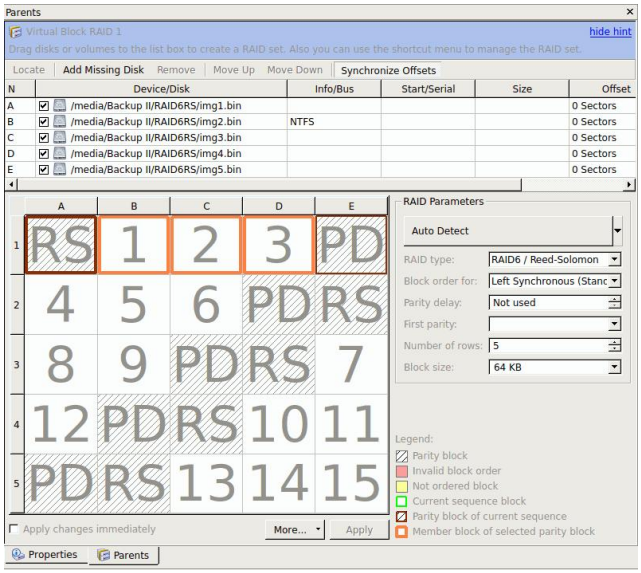
- Right-click the Parents tab and select the required partition from the context menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Parents **tab**



Note: Objects should be placed in the same order as they were in the original volume set. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Object control buttons

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original volume set.

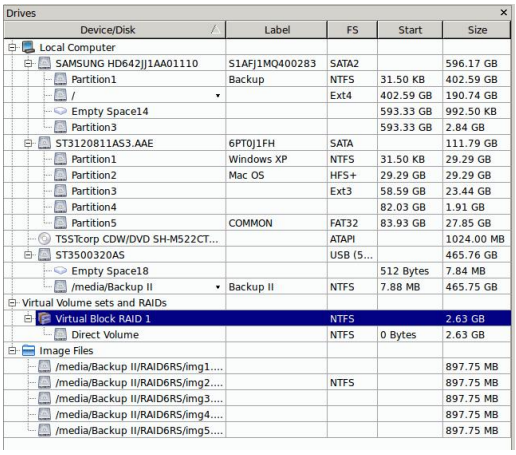
You also need to specify Blocks order (Left Synchronous (standard) for our case) for virtual RAID 6. You may select it on the Blocks order drop-down or context menu.

If the those parameters are not correct, data on the parents will not be damaged, but they cannot be recovered.

Note: You may check how correctly you have reconstructed the original volume set or RAID. Find a file and preview it. If the file appears correct, you have created a correct RAID layout.

> The Virtual Block RAID object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel. The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.


Drives
Device/Disk
Label
FS
Start
Size
Local Computer
SAMSUNG HD642JJ1AA01110 S1AFJ1MQ400283 SATA2 596.17 GB
Partition1 Backup NTFS 31.50 KB 402.59 GB
/ Ext4 402.59 GB 190.74 GB
Empty Space14 593.33 GB 992.50 KB
Partition3 593.33 GB 2.84 GB
ST3120811AS3.AAE 6PT0J1FH SATA 111.79 GB
Partition1 Windows XP NTFS 31.50 KB 29.29 GB
Partition2 Mac OS HFS+ 29.29 GB 29.29 GB
Partition3 Ext3 58.59 GB 23.44 GB
Partition4 82.03 GB 1.91 GB
Partition5 COMMON FAT32 83.93 GB 27.85 GB
TSSTcorp CDW/DVD SH-M522CT... ATAPI 1024.00 MB
ST3500320AS USB (5... 465.76 GB
Empty Space18 512 Bytes 7.84 MB
/media/Backup II Backup II NTFS 7.88 MB 465.75 GB
Virtual Volume sets and RAIDs
Virtual Block RAID 1 NTFS 2.63 GB
Direct Volume NTFS 0 Bytes 2.63 GB
Image Files
/media/Backup II/RAID6RS/img1.... 897.75 MB
/media/Backup II/RAID6RS/img2.... NTFS 897.75 MB
/media/Backup II/RAID6RS/img3.... 897.75 MB
/media/Backup II/RAID6RS/img4.... 897.75 MB
/media/Backup II/RAID6RS/img5.... 897.75 MB

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2.4.4 Working with RAID6 (Double Xor) Presets

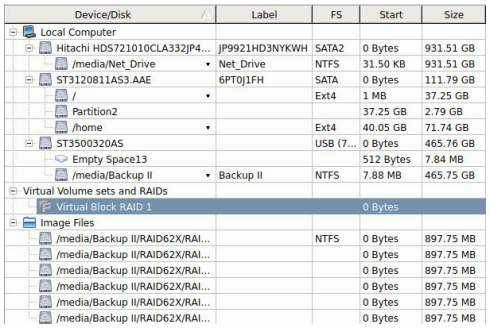
R-Studio allows you to create and process RAID 6 Double Xor layouts with the following presets:
EVENODD RAID DP X-Code(2) Adaptec 3805
In addition you may create your own RAID 6 configurations.

Creating a RAID 6 (Double Xor) object from a preset:
We will use the EVENODD preset as an example.

To create a RAID 6 (Double Xor) object

1 **Click the Create Virtual RAID button and select Create Virtual Block RAID**
or select the **Create Virtual Block RAID** on the **Create** menu

> **A Virtual Block RAID object will appear on the** Drives **panel**


Device/Disk
Label
FS
Start
Size
Local Computer
Hitachi HDS721010CLA332JP4... JP9921HD3NYKWH SATA2 0 Bytes 931.51 GB
/media/Net_Drive Net_Drive NTFS 31.50 KB 931.51 GB
ST3120811AS3.AAE 6PT0J1FH SATA 0 Bytes 111.79 GB
/ Ext4 1 MB 37.25 GB
Partition2 37.25 GB 2.79 GB
/home Ext4 40.05 GB 71.74 GB
ST3500320AS USB (7... 0 Bytes 465.76 GB
Empty Space13 512 Bytes 7.84 MB
/media/Backup II Backup II NTFS 7.88 MB 465.75 GB
Virtual Volume sets and RAIDs
Virtual Block RAID 1 0 Bytes
Image Files
/media/Backup II/RAID62X/RAI... NTFS 0 Bytes 897.75 MB
/media/Backup II/RAID62X/RAI... 0 Bytes 897.75 MB
/media/Backup II/RAID62X/RAI... 0 Bytes 897.75 MB
/media/Backup II/RAID62X/RAI... 0 Bytes 897.75 MB
/media/Backup II/RAID62X/RAI... 0 Bytes 897.75 MB
/media/Backup II/RAID62X/RAI... 0 Bytes 897.75 MB

2 **Select RAID 6 / Double Xor on the RAID type**

3 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

Other ways to add objects

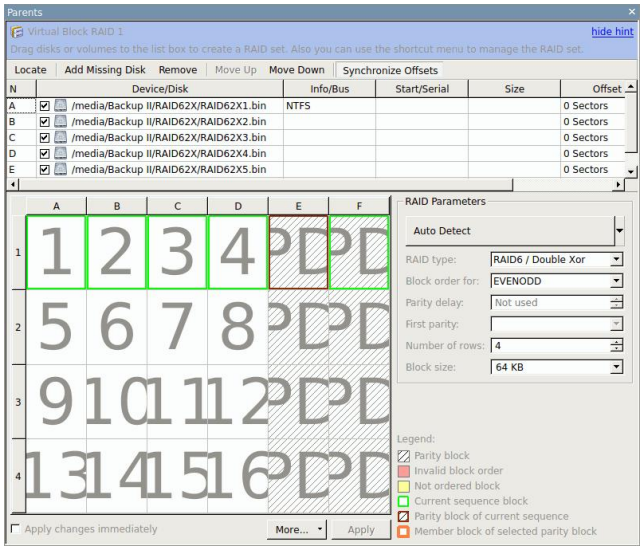
- Right-click the Parents tab and select the required partition from the context menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Parents **tab**



Note: Objects should be placed in the same order as they were in the original volume set. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Object control buttons

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original volume set.

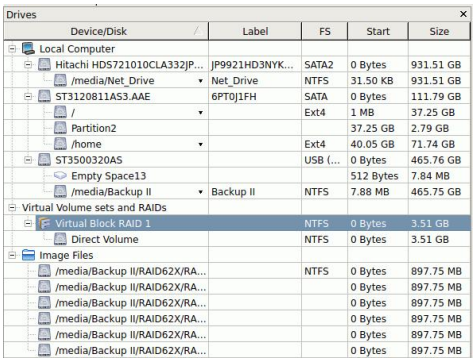
You also need to specify Blocks order (EVENODD for our case) for virtual RAID 6 (Double Xor). You may select it on the Blocks order drop-down or context menu.

If the those parameters are not correct, data on the parents will not be damaged, but they cannot be recovered.

Note: You may check how correctly you have reconstructed the original volume set or RAID. Find a file and preview it. If the file appears correct, you have created a correct RAID layout.

> **The Virtual Block RAID object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel. The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.



You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.5 Working with RAIDs with Parity Delays

R-Studio allows you to create RAIDs with parity delays (any level that allows that). For example, let us create a RAID 5 the parity delays with the following layout:

- Three disks,
- Delay=16
- Block size: 16 KB
- Offset: 1088 sectors (544 KB)
- Block order: Left Asynchronous (Continuous)

Block order table:

	A	B	C	
1	1	2	PD	
2	3	4	PD	
3	5	6	PD	
4	7	8	PD	
5	9	10	PD	
6	11	12	PD	
7	13	14	PD	
8	15	16	PD	Delay=16
9	17	18	PD	
10	19	20	PD	
11	21	22	PD	
12	23	24	PD	
13	25	26	PD	
14	27	28	PD	
15	29	30	PD	
16	31	32	PD	
17	33	PD	34	
18	35	PD	36	Delay=16
19	37	PD	38	
20	39	PD	40	

21	41	PD	42	
22	43	PD	44	
23	45	PD	46	
24	47	PD	48	
25	49	PD	50	
26	51	PD	52	
27	53	PD	54	
28	55	PD	56	
29	57	PD	58	
30	59	PD	60	
31	61	PD	62	
32	63	PD	64	
33	PD	65	66	Delay=16
34	PD	67	68	
35	PD	69	70	
36	PD	71	72	
37	PD	73	74	
38	PD	75	76	
39	PD	77	78	
40	PD	79	80	
41	PD	81	82	
42	PD	83	84	
43	PD	85	86	
44	PD	87	88	
45	PD	89	90	
46	PD	91	92	
47	PD	93	94	
48	PD	95	96	

To create such RAID 5,

1 **Click the Create virtual volume sets or RAIDs button and select Create Virtual Block RAID & Autodetect** or select **Create Virtual Block RAID & Autodetect** on the **Create** menu

Check that the Apply changes immediately check box is clear on the Parents tab. This will prevent **R-Studio** from trying to start processing the RAID configuration until you specify it completely.

2 **Drug the required objects from the** Drives **pane to the** Parents **tab and select RAID 5 on the RAID type**

Other ways to add objects

- Right-click the Parents tab and select the required partition from the context menu,

or

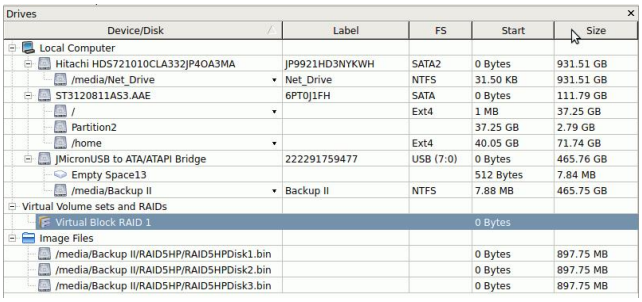
- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

These objects may be hard drives, logical disks, or images. Check that the objects are correctly placed.

Note: Objects should be placed in the same order as they were in the original RAID 5. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Object control buttons

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID



3 Specify the Block size and Offset parameters on the Parents tab

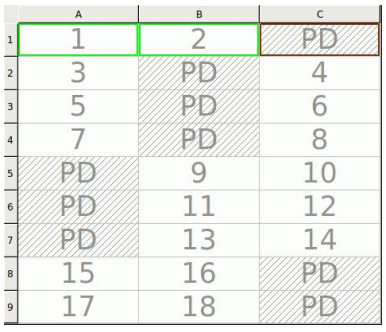
Disregard the Block order field.

4 Specify the parity delay number in the Parity delay control on the Parents tab.

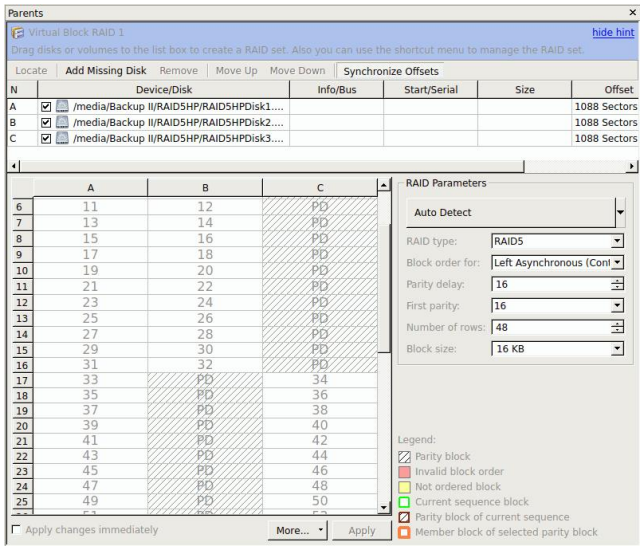
The number of rows will change to 48.

- If necessary, adjust the First parity parameter

By default, this parameter is set equal to Parity delay. By changing it, you may "shift" the block order table. For example, when the First parity parameter is set as 1 for the RAID 5 of 3 disks with Parity delay of 3., the block order table will be the following:**First parity parameter**

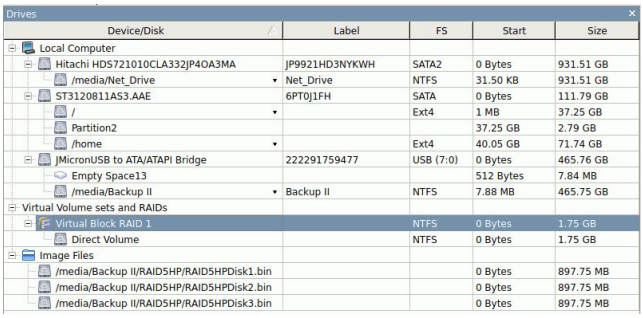


5 Select Left Asynchronous (Continuous) on the Block Order Field and click the Apply button on the Parents **tab**



> The created Virtual Block RAID 1 object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on this RAID object, a partition object will appear on the Drives panel.



The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.6 Working with Advanced RAID Layouts

R-Studio allows you to create and process very complex custom RAID layouts.

For example, let us create a RAID 5 with the following layout:

- Three disks,
- Block size: 64 KB
- Offset: 32768 sectors (64 KB)
- Block order:

	A	B	C
1	PD	1	2
2	PD	3	4

3	PD	5	6
4	7	PD	8
5	9	PD	10
6	11	PD	12
7	13	14	PD
8	15	16	PD
9	17	18	PD

To create such RAID 5,

1 **Click the Create virtual volume sets or RAIDs button and select Create Virtual Block RAID**

3 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

Other ways to add objects

- Right-click the Parents tab and select the required partition from the context menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

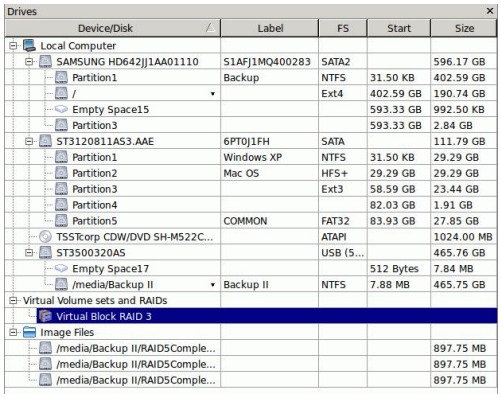
Check that the Apply changes immediately check box is clear on the Parents tab. This will prevent **R-Studio** from trying to start processing the RAID configuration until you specify it completely.

2 **Drug the required objects from the** Drives **pane to the** Parents **tab and select Custom on the RAID type**

These objects may be hard drives, logical disks, or images. Check that the objects are correctly placed.

Object control buttons

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID


Drives
Device/Disk
Label
FS
Start
Size
Local Computer
SAMSUNG HD642JJ1AA01110 S1AFJ1MQ400283 SATA2 596.17 GB
Partition1 Backup NTFS 31.50 KB 402.59 GB
/ Ext4 402.59 GB 190.74 GB
Empty Space15 593.33 GB 992.50 KB
Partition3 593.33 GB 2.84 GB
ST3120811AS3.AAE 6PT0J1FH SATA 111.79 GB
Partition1 Windows XP NTFS 31.50 KB 29.29 GB
Partition2 Mac OS HFS+ 29.29 GB 29.29 GB
Partition3 Ext3 58.59 GB 23.44 GB
Partition4 82.03 GB 1.91 GB
Partition5 COMMON FAT32 83.93 GB 27.85 GB
TSSTcorp CDW/DVD SH-M522C... ATAPI 1024.00 MB
ST3500320AS USB (5... 465.76 GB
Empty Space17 512 Bytes 7.84 MB
/media/Backup II Backup II NTFS 7.88 MB 465.75 GB
Virtual Volume sets and RAIDs
Virtual Block RAID 3
Image Files
/media/Backup II/RAID5Comple... 897.75 MB
/media/Backup II/RAID5Comple... 897.75 MB
/media/Backup II/RAID5Comple... 897.75 MB

3 **Specify the Block size and Offset parameters on the** Parents **tab**

Disregard the Block order field.

4 Manually enter 9 to Number of rows on the Parents **tab**

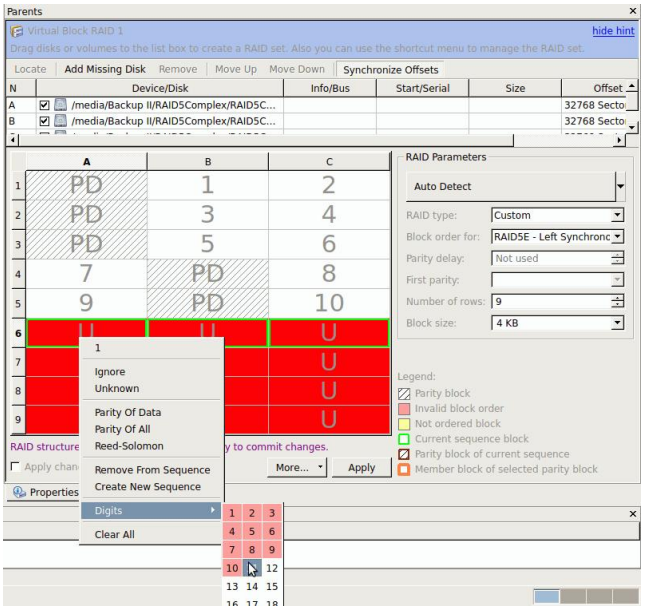
Block order will change to Custom.

5 Enter the block order in the table on the Parents **tab**

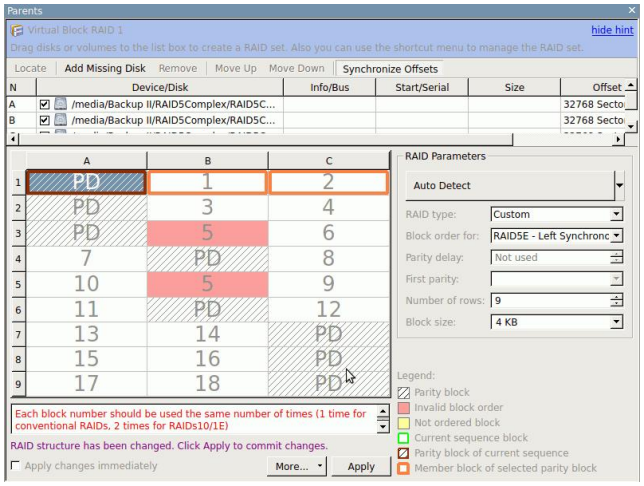
Use the RAID sequence window to move from one row to another.

Using the keyboard: arrow keys to navigate, digit and pd keys to enter the block order.

Using the mouse: right-click the cell and select the number or parity from the context menu. If the block table is too large, you better use the keyboard to enter the digits.

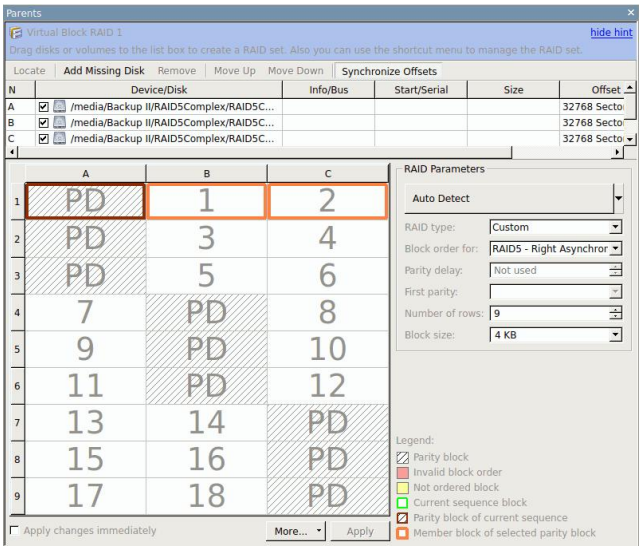


Corrections: **R-Studio** will tell you if some digits are not correct. Navigate to the required cell and enter the correct value. Use the **Delete** key to clear a cell.


Parents
Virtual Block RAID 1
hide hint
Drag disks or volumes to the list box to create a RAID set. Also you can use the shortcut menu to manage the RAID set.
Locate
Add Missing Disk
Remove
Move Up
Move Down
Synchronize Offsets
RAID Parameters
Auto Detect
RAID type: Custom
Block order for: RAID5E - Left Synchronc
Parity delay: Not used
First parity:
Number of rows: 9
Block size: 4 KB
Legend:
Parity block
Invalid block order
Not ordered block
Current sequence block
Parity block of current sequence
Member block of selected parity block
Each block number should be used the same number of times (1 time for conventional RAIDs, 2 times for RAIDs10/1E)
RAID structure has been changed. Click Apply to commit changes.
Apply changes immediately
More...
Apply

Clear the table: Right-click the table and select **Clear all** on the context menu.

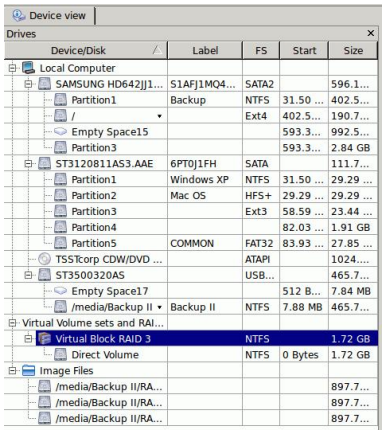
6 When you finishes entering the information, click the Apply button on the Parents **tab**



> **The created Virtual Block RAID 1 object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on this RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.


Device view
Drives
Device/Disk
Label
FS
Start
Size
Local Computer
SAMSUNG HD642JJ1... S1AFJ1MQ4... SATA2 596.1...
Partition1 Backup NTFS 31.50 ... 402.5...
/ Ext4 402.5... 190.7...
Empty Space15 593.3... 992.5...
Partition3 593.3... 2.84 GB
ST3120811AS3.AAE 6PT0J1FH SATA 111.7...
Partition1 Windows XP NTFS 31.50 ... 29.29 ...
Partition2 Mac OS HFS+ 29.29 ... 29.29 ...
Partition3 Ext3 58.59 ... 23.44 ...
Partition4 82.03 ... 1.91 GB
Partition5 COMMON FAT32 83.93 ... 27.85 ...
TSSTcorp CDW/DVD ... ATAPI 1024....
ST3500320AS USB... 465.7...
Empty Space17 512 B... 7.84 MB
/media/Backup II Backup II NTFS 7.88 MB 465.7...
Virtual Volume sets and RAI...
Virtual Block RAID 3 NTFS 1.72 GB
Direct Volume NTFS 0 Bytes 1.72 GB
Image Files
/media/Backup II/RA... 897.7...
/media/Backup II/RA... 897.7...
/media/Backup II/RA... 897.7...

Advanced RAID 5

Another example is a RAID with the following layout, similar to that used in Mac Pro internal RAID cards with 4 hard drives.

- Four disks,
- Block size: 512 KB (1024 sectors)
- Offset: 32768 sectors (64 KB)
- Block order:

A	B	C	D	A	B	C	D	A	B	C	D
PD	1	2	PD	3	4	PD	5	6	PD	7	8

As you see, this layout cannot be fit directly into a standard 2D block order table. Still, it's possible to create such RAID layout using the RAID Sequence window.

To create such RAID,

1 **Click the Create virtual volume sets or RAIDs button and select Create Virtual Block RAID & Autodetect**
or select **Create Virtual Block RAID & Autodetect** on the **Create** menu
Check that the Apply changes immediately check box is clear on the Parents tab. This will prevent **R-Studio** from trying to start processing the RAID configuration until you specify it completely.

2 **Drug the required objects from the** Drives **pane to the** Parents **tab and select RAID 5 on the RAID type**

Other ways to add objects

- Right-click the Parents tab and select the required partition from the context menu,

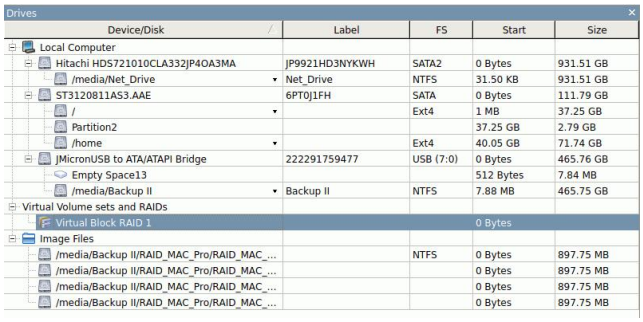
or

- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

These objects may be hard drives, logical disks, or images. Check that the objects are correctly placed.

Object control buttons

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID



3 **Specify the Block size and Offset parameters on the** Parents **tab**
Disregard the Block order field.

4 **Manually enter 3 to Number of rows on the** Parents **tab and change Block order to Custom**

5 **Right-click the** RAID Sequence **window and select Remove All. Manually enter 3 to Number of rows on the** Parents **tab and change Block order to Custom**

6 **Right-click Cell 1 in the block order table and select Create New Sequence.**

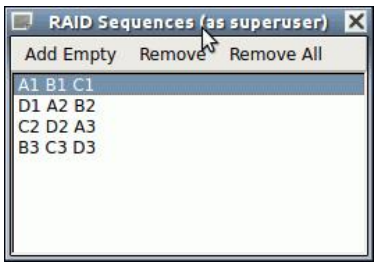
7 **Right-click Cell 2 in the block order table and select Add to Sequence, do that for Cell 3, too.**

8 **Right-click Cell 4 in the block order table and select Create New Sequence.**

9 **Right-click Cell 5 in the block order table and select Add to Sequence, do that for Cell 6, too.**
Continue those steps for the rest of the table until the RAID Sequence window will have 4 sequences of 3

disks:

Sequences **window**



10 **Select the first line in the** RAID Sequence **window, right-click Cell 1 in the block order table, and select Parity of Data.**

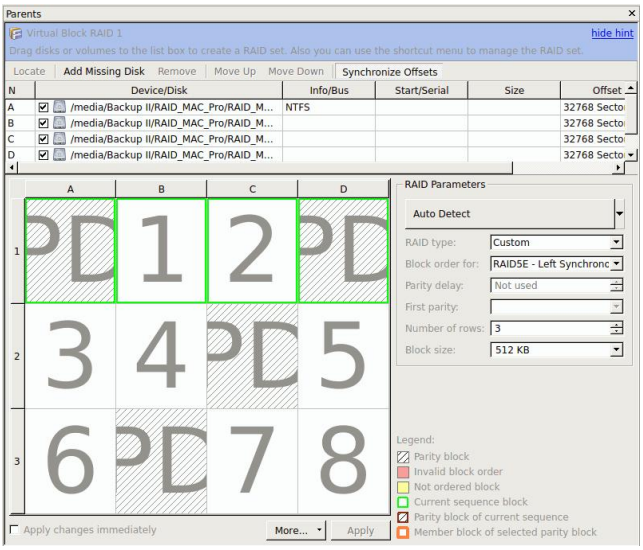
If any unnecessary sequences appear, right-click them in the RAID Sequence window, and select Remove.

11 **Right-click Cell 2 in the block order table and select 1, do that for Cell 3 selecting 2.**

If any unnecessary sequences appear, right-click them in the RAID Sequence window, and select Remove.

12 **Move to the next sequence in the** RAID Sequence **window and repeat the procedure for cells 4, 5, and 6.**

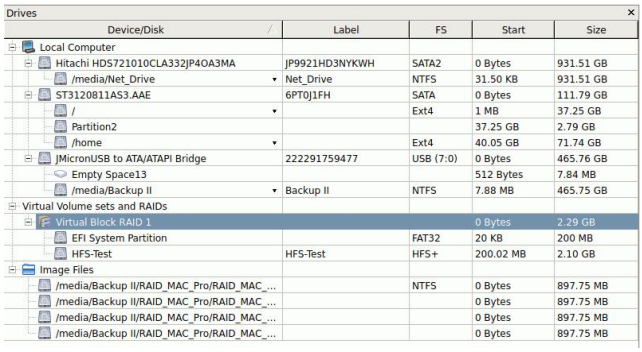
Do that for the rest of the sequences until you fill all cells in the block order table in the Parents **tab.**



> **The created Virtual Block RAID 1 object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on this RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.



You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

Advanced RAID 6 Layout

For example, let us create a RAID 6 with the following layout:

- Five disks,
- Block size: 64 KB
- Offset: 0
- Block order:

	A	B	C	D	E
1	RS	1	2	3	PD
2	4	5	6	PD	RS
3	8	9	PD	RS	7
4	12	PD	RS	10	11
5	PD	RS	13	14	15
6	PA	PA	PA	PA	PA

where

PD is parity of data;
PA is parity of all;
RS is Reed-Solomon;

Rows from 1 to 5 use two types of error correction: parity of data (xor) and Reed-Solomon. That is, row 1 uses blocks A1 and E1, row 2 uses blocks D2 and E2, and so on.

Row 6 is used for error correction for columns. That is, column A uses block A6, column B uses B6, and so on. Parity of all is used for error correction.

1 Click the Create virtual volume sets or RAIDs button and select Create Virtual Block RAID

3 Drag the required partitions from the Drives **panel to the** Parents **tab**

Other ways to add objects

- Right-click the Parents tab and select the required partition from the context menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

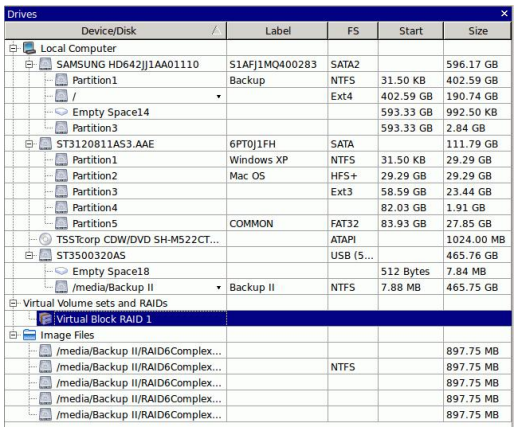
Check that the Apply changes immediately check box is clear on the Parents tab. This will prevent **R-Studio** from trying to start processing the RAID configuration until you specify it completely.

2 **Drug the required objects from the** Drives **pane to the** Parents **tab and select Custom on the RAID type**

These objects may be hard drives, logical disks, or images. Check that the objects are correctly placed.

Object control buttons

Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID


Drives
Device/Disk
Label
FS
Start
Size
Local Computer
SAMSUNG HD642JJ1AA01110 S1AFJ1MQ400283 SATA2 596.17 GB
Partition1 Backup NTFS 31.50 KB 402.59 GB
/ Ext4 402.59 GB 190.74 GB
Empty Space14 593.33 GB 992.50 KB
Partition3 593.33 GB 2.84 GB
ST3120811AS3.AAE 6PT0J1FH SATA 111.79 GB
Partition1 Windows XP NTFS 31.50 KB 29.29 GB
Partition2 Mac OS HFS+ 29.29 GB 29.29 GB
Partition3 Ext3 58.59 GB 23.44 GB
Partition4 82.03 GB 1.91 GB
Partition5 COMMON FAT32 83.93 GB 27.85 GB
TSSTcorp CDW/DVD SH-M522CT... ATAPI 1024.00 MB
ST3500320AS USB (5... 465.76 GB
Empty Space18 512 Bytes 7.84 MB
/media/Backup II Backup II NTFS 7.88 MB 465.75 GB
Virtual Volume sets and RAIDs
Virtual Block RAID 1
Image Files
/media/Backup II/RAID6Complex... 897.75 MB
/media/Backup II/RAID6Complex... NTFS 897.75 MB
/media/Backup II/RAID6Complex... 897.75 MB
/media/Backup II/RAID6Complex... 897.75 MB
/media/Backup II/RAID6Complex... 897.75 MB

3 **Specify the Block size and Offset parameters on the** Parents **tab**

Disregard the Block order parameter.

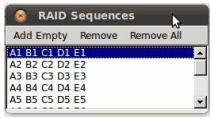
4 **Manually enter 6 to Number of rows on the** Parents **tab**

5 **Enter the block order in the table on the** Parents **tab**

You may enter either a block number, or an error correction block of the following types:

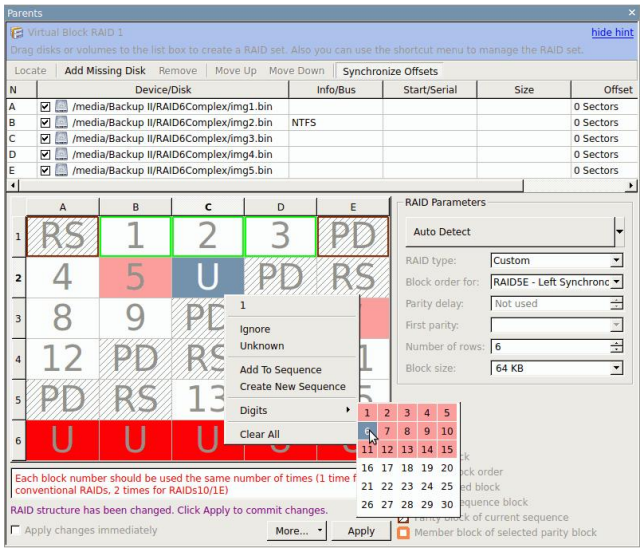
PD	Parity of data
PA	Parity of all
RS	Reed-Solomon
U	Unknown
I	Ignore

Note: You should specify an error correction block only when the correct sequence is selected on the RAID Sequences window.



Using the keyboard: arrow keys to navigate, digit, and rs, pd, pa, u, i keys to enter the block order.

Using the mouse: right-click the cell and select the number or parity from the context menu. If the block table is too large, you better use the keyboard to enter the digits.



For the rows:

Select the required row sequence on the RAID Sequences window, select the cell on the RAID table, and enter the required value. **R-Studio** automatically generates those sequences when you add RAID parents.

For the columns and arbitrary sequences:

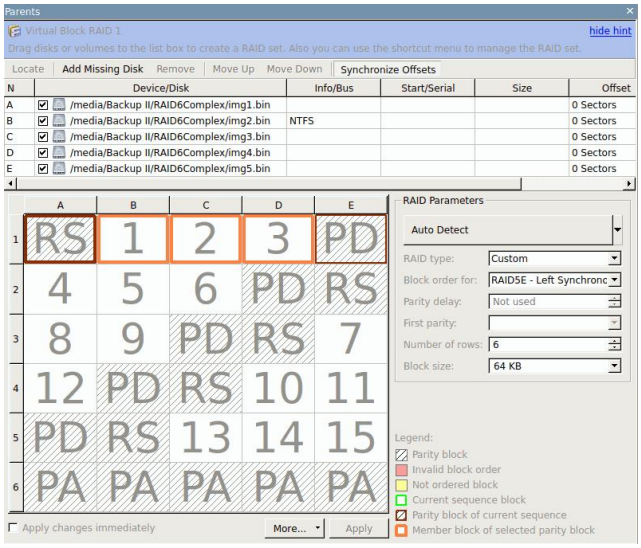
You need to create those sequences and add the respective blocks to it manually.

To create a sequence: Click **Add empty** on the RAID Sequences window or select **Create New Sequence** on the context menu on the Parents tab.

To add a block to a sequence: Right-click the respective cell and select **Add To Sequence** on the context menu on the Parents tab.

To remove a block to a sequence: Right-click the respective cell and select **Remove From Sequence** on the context menu on the Parents tab.

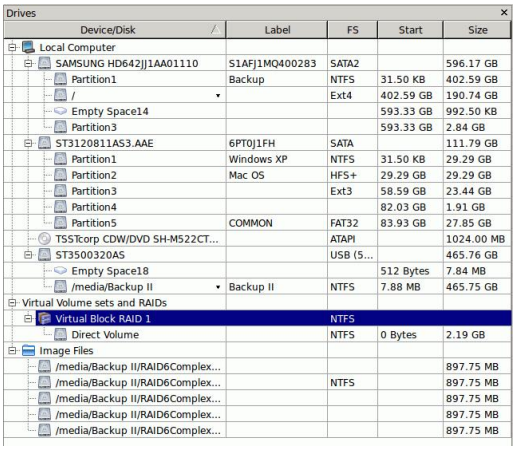
6 When you finishes entering the information, click the Apply button on the Parents tab



> The created Virtual Block RAID 1 object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on this RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.


Drives
Device/Disk
Label
FS
Start
Size
Local Computer
SAMSUNG HD642JJ1AA01110 S1AFJ1MQ400283 SATA2 596.17 GB
Partition1 Backup NTFS 31.50 KB 402.59 GB
/ Ext4 402.59 GB 190.74 GB
Empty Space14 593.33 GB 992.50 KB
Partition3 593.33 GB 2.84 GB
ST3120811AS3.AAE 6PT0J1FH SATA 111.79 GB
Partition1 Windows XP NTFS 31.50 KB 29.29 GB
Partition2 Mac OS HFS+ 29.29 GB 29.29 GB
Partition3 Ext3 58.59 GB 23.44 GB
Partition4 82.03 GB 1.91 GB
Partition5 COMMON FAT32 83.93 GB 27.85 GB
TSSTcorp CDW/DVD SH-M522CT... ATAPI 1024.00 MB
ST3500320AS USB (5... 465.76 GB
Empty Space18 512 Bytes 7.84 MB
/media/Backup II Backup II NTFS 7.88 MB 465.75 GB
Virtual Volume sets and RAIDs
Virtual Block RAID 1 NTFS
Direct Volume NTFS 0 Bytes 2.19 GB
Image Files
/media/Backup II/RAID6Complex... 897.75 MB
/media/Backup II/RAID6Complex... NTFS 897.75 MB
/media/Backup II/RAID6Complex... 897.75 MB
/media/Backup II/RAID6Complex... 897.75 MB
/media/Backup II/RAID6Complex... 897.75 MB

2.4.7 Nested and Non-Standard RAID Levels

- **RAID10 (1+0)**
- **RAID1E**
- **RAID5E**
- **RAID5EE**
- **RAID6E**

2.4.7.1 RAID10 (1+0)

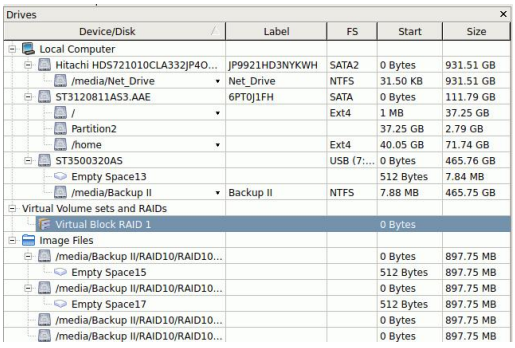
A RAID 10 (or 1+0) is a stripe of mirrors. Its block order can be represented as:

	A	B	C	D
1	1	1	2	2

To create a RAID 10 object

1 **Click the Create Virtual RAID button and select Create Virtual Block RAID**
or select the **Create Virtual Block RAID** on the **Create** menu

> **A Virtual Block RAID object will appear on the** Drives **panel**


Drives
Device/Disk
Label
FS
Start
Size
Local Computer
Hitachi HDS721010CLA332JP4O... JP9921HD3NYKWH SATA2 0 Bytes 931.51 GB
/media/Net_Drive Net_Drive NTFS 31.50 KB 931.51 GB
ST3120811AS3.AAE 6PT0J1FH SATA 0 Bytes 111.79 GB
/ Ext4 1 MB 37.25 GB
Partition2 37.25 GB 2.79 GB
/home Ext4 40.05 GB 71.74 GB
ST3500320AS USB (7:... 0 Bytes 465.76 GB
Empty Space13 512 Bytes 7.84 MB
/media/Backup II Backup II NTFS 7.88 MB 465.75 GB
Virtual Volume sets and RAIDs
Virtual Block RAID 1 0 Bytes
Image Files
/media/Backup II/RAID10/RAID10... 0 Bytes 897.75 MB
Empty Space15 512 Bytes 897.75 MB
/media/Backup II/RAID10/RAID10... 0 Bytes 897.75 MB
Empty Space17 512 Bytes 897.75 MB
/media/Backup II/RAID10/RAID10... 0 Bytes 897.75 MB
/media/Backup II/RAID10/RAID10... 0 Bytes 897.75 MB

2 **Drag the required partitions from the** Drives **panel to the** Parents **tab**

Other ways to add objects

- Right-click the Parents tab and select the required partition from the context menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

3 Select RAID 10 on the RAID type

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 10. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Object control buttons

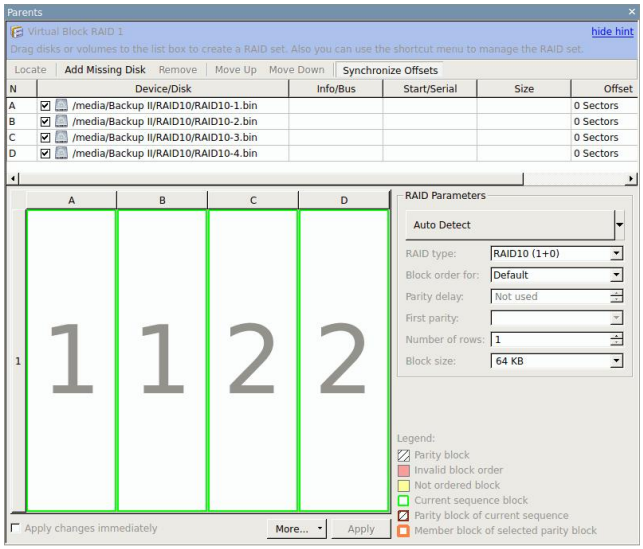
Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 10.

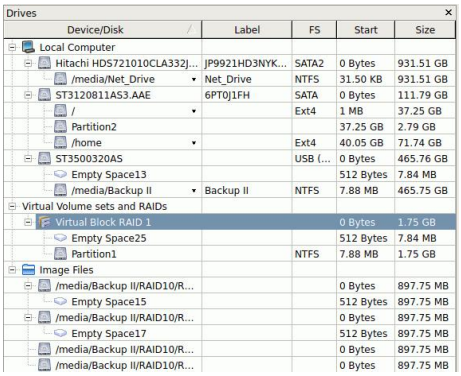
You also need to specify Block order for virtual RAID 10. You may select it on the Block order drop-down or context menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 10 cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 10. Find a file and preview it. If the file appears correct, you have created a correct RAID 10 layout.



Parents **tab**



> **The *RAID 10* object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.7.2 RAID1E

RAID 1E is utilizes both the mirroring and striping: data is striped across all drives, as in RAID 0. Additionally, a copy of each stripe is stored on a different drive, as in RAID 1. Its block order can be represented as:

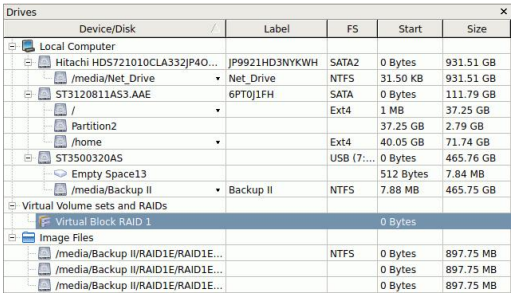
	A	B	C
1	1	1	2
2	2	3	3

To create a RAID 1E object

1 Click the Create Virtual RAID button and select Create Virtual Block RAID

or select the **Create Virtual Block RAID** on the **Create** menu

> **A Virtual Block RAID object will appear on the Drives panel**



2 Drag the required partitions from the Drives panel to the Parents tab

Other ways to add objects

- Right-click the Parents tab and select the required partition from the context menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

3 Select RAID 1E on the RAID type

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 1E. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Object control buttons

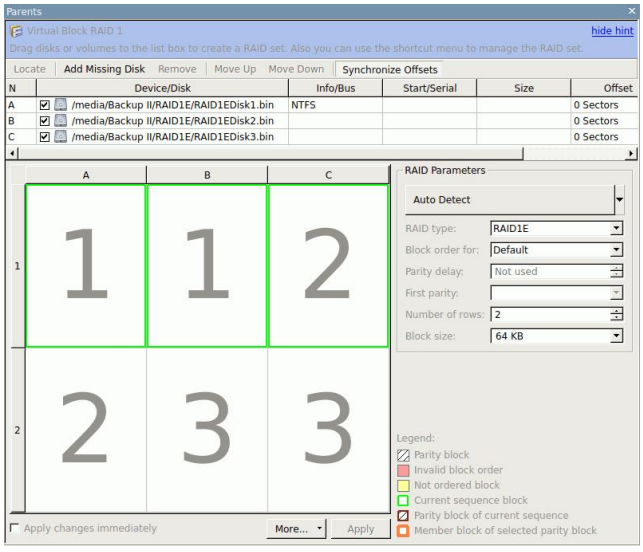
Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 1E.

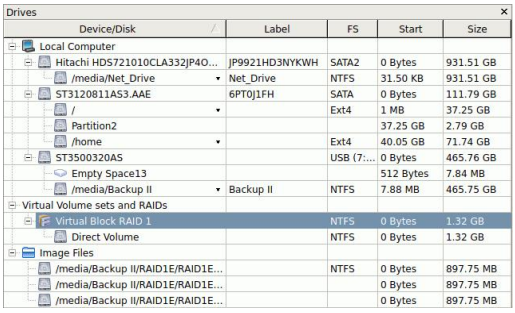
You also need to specify Block order for virtual RAID 1E You may select it on the Block order drop-down or context menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 1E cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 1E. Find a file and preview it. If the file appears correct, you have created a correct RAID 1E layout.



Parents **tab**



> **The *RAID 1E* object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.7.3 RAID5E

RAID 5E (where E stands for Enhanced) is a RAID 5 layout with an integrated hot-spare drive, where the spare drive is an active part of the block rotation scheme. An example of such RAID layout is in the table below:

	A	B	C	D
1	1	2	3	PD
2	5	6	PD	4
3	9	PD	7	8
4	PD	10	11	12
5	SP	SP	SP	SP

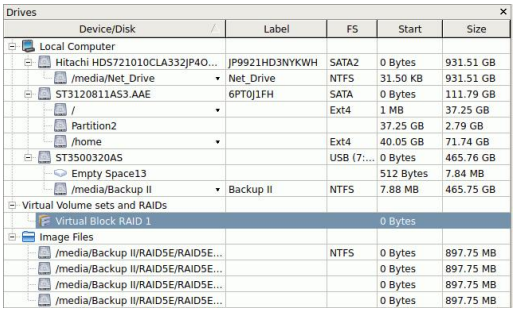
where PD and SP stand for Parity of Data and Spare Part.

To create a RAID 5E object

1 **Click the Create Virtual RAID button and select Create Virtual Block RAID**

or select the **Create Virtual Block RAID** on the **Create** menu

> **A Virtual Block RAID object will appear on the Drives panel**



2 **Drag the required partitions from the Drives panel to the Parents tab**

Other ways to add objects

- Right-click the Parents tab and select the required partition from the context menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

3 Select RAID 5E on the RAID type

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 5E. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Object control buttons

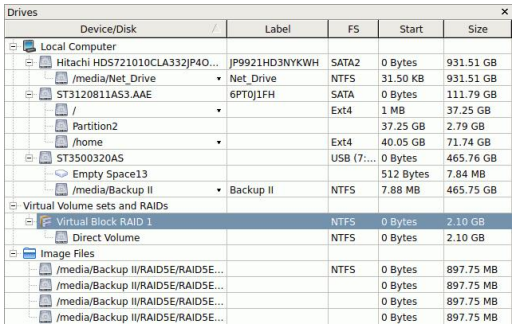
Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 5E.

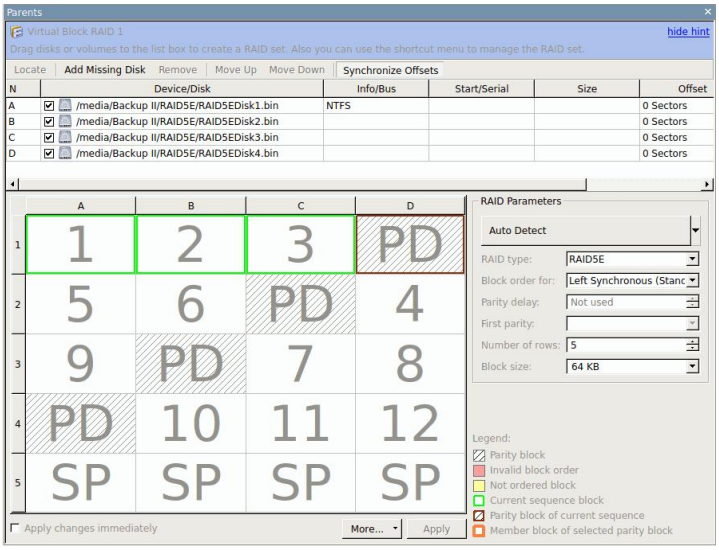
You also need to specify Block order for virtual RAID 5E You may select it on the Block order drop-down or context menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 5E cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 5E. Find a file and preview it. If the file appears correct, you have created a correct RAID 5E layout.



Parents **tab**



> The *RAID 5E* object can now be processed like regular drives/volumes

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.7.4 RAID5EE

RAID 5EE (where E stands for Enhanced) is a RAID 5 layout with an integrated hot-spare drive, where the spare drive is an active part of the block rotation scheme. An example of such RAID layout is in the table below:

	A	B	C	D
1	1	2	SP	PD
2	4	SP	PD	3
3	SP	PD	5	6
4	PD	7	8	SP

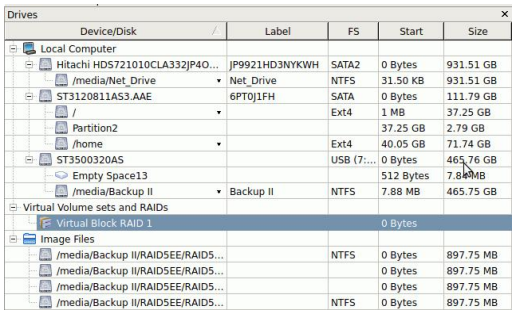
where PD and SP stand for Parity of Data and Spare Part.

To create a RAID 5EE object

1 Click the Create Virtual RAID button and select Create Virtual Block RAID

or select the **Create Virtual Block RAID** on the **Create** menu

> **A Virtual Block RAID object will appear on the** Drives **panel**



2 Drag the required partitions from the Drives **panel to the** Parents **tab**

Other ways to add objects

- Right-click the Parents tab and select the required partition from the context menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

3 Select RAID 5EE on the RAID type

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 5EE. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Object control buttons

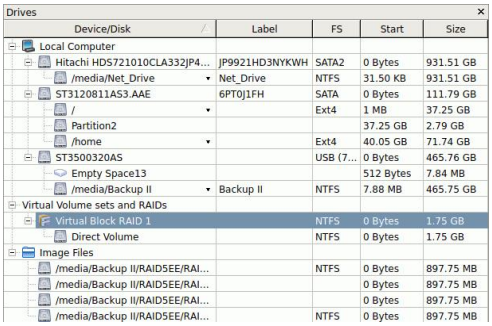
Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 5EE.

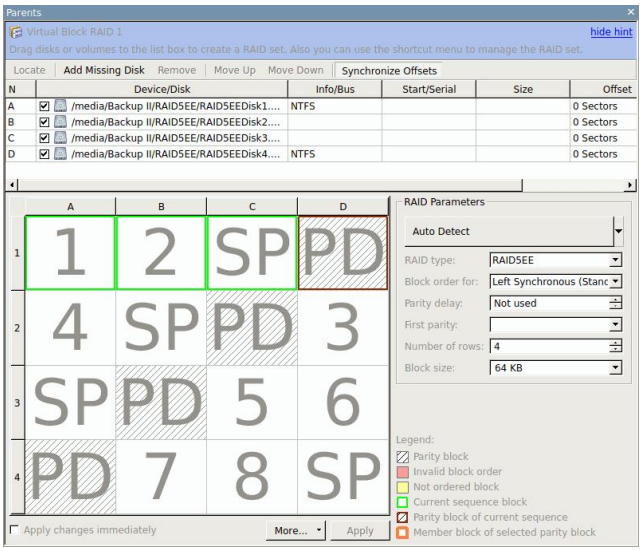
You also need to specify Block order for virtual RAID 5EE You may select it on the Block order drop-down or context menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 5EE cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 5EE. Find a file and preview it. If the file appears correct, you have created a correct RAID 5EE layout.



Parents **tab**



> **The *RAID 5EE* object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.7.5 RAID6E

RAID 6E (where E stands for Enhanced) is a RAID 6 layout with an integrated hot-spare drive, where the spare drive is an active part of the block rotation scheme. An example of such RAID layout is in the table below:

	A	B	C	D	E	F
1	RS	1	2	3	4	PD
2	5	6	7	8	PD	RS
3	10	11	12	PD	RS	9
4	15	16	PD	RS	13	14
5	20	PD	RS	17	18	19
6	PD	RS	21	22	23	24
7	SP	SP	SP	SP	SP	SP

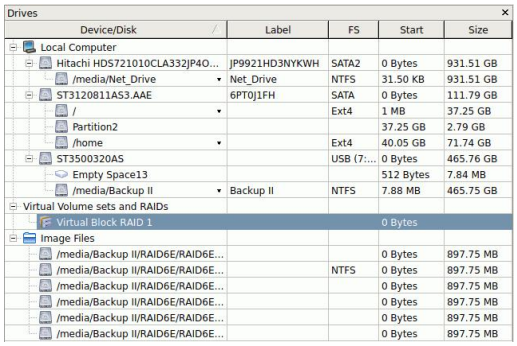
where RS, PD and SP stand for Reed-Solomon, Parity of Data, and Spare Part, respectively.

To create a RAID 6E object

1 Click the Create Virtual RAID button and select Create Virtual Block RAID

or select the **Create Virtual Block RAID** on the **Create** menu

> A Virtual Block RAID object will appear on the Drives **panel**



2 Drag the required partitions from the Drives **panel to the** Parents **tab**

Other ways to add objects

- Right-click the Parents tab and select the required partition from the context menu,

or

- Right-click the partition on the Drives panel, select **Add to RAID** on the context menu, and select the RAID object you want to add the partition to.

3 Select RAID 6E on the RAID type

You may either make **R-Studio** to process your changes immediately or wait until you finish editing the RAID layout. Select or clear the Apply changes immediately checkbox on the Parents tab. Click the **Apply** button to apply the changes when are you through.

Note: Objects should be placed in the same order as they were in the original RAID 6E. If this order is incorrect, you must change it by dragging the parents to place them in the correct order.

Object control buttons

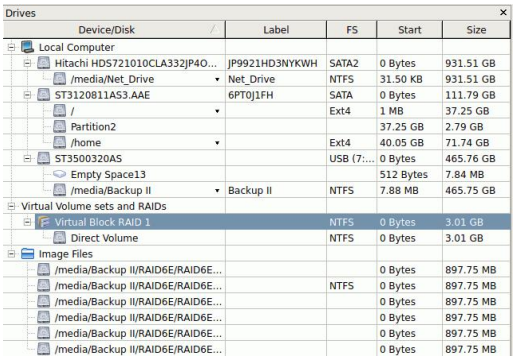
Locate	Click this button to locate the selected object in the Drives panel.
Add Empty Space/Add Missing Disk	Click this button to add an empty space or missing disk object to the RAID
Remove	Click this button to remove the selected object from the RAID
Move Up	Click this button to move up the selected object in the RAID
Move Down	Click this button to move down the selected object in the RAID
Synchronize Offsets	Click this button to make the offsets the same for all objects in the RAID

The RAID block size and Offset (in sectors) parameters must be set the same as for the original RAID 6E.

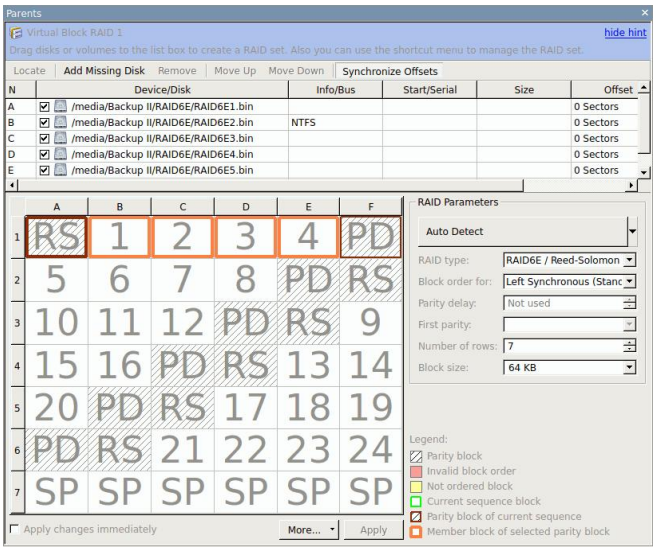
You also need to specify Block order for virtual RAID 6E You may select it on the Block order drop-down or context menu.

If the those parameters are not correct, data on the parents will not be damaged, but files from the RAID 6E cannot be recovered.

Note: You may check how correctly you have reconstructed the original RAID 6E. Find a file and preview it. If the file appears correct, you have created a correct RAID 6E layout.



Parents **tab**



> **The *RAID 6E* object can now be processed like regular drives/volumes**

If **R-Studio** detects a valid file system on the newly created RAID object, a partition object will appear on the Drives panel.

The **Description Files for RAID Configurations** topic shows the RAID description file for this RAID configuration.

You also may check the RAID consistency, if necessary. See the **Checking RAID Consistency** help page for details.

2.4.8 Various Disk and Volume Managers

R-Studio can work with objects created by various disk and volume managers. Currently, the following managers are supported:

- **Windows Storage Spaces**
- **Apple RAIDs**
- **Logical Volume Manager (LVM and LVM2)**

R-Studio can automatically recognize and add their physical components, component images, or the user can manually add the components when their data is damaged so severely that **R-Studio** cannot recognize them.

2.4.8.1 Working with Windows Storage Spaces

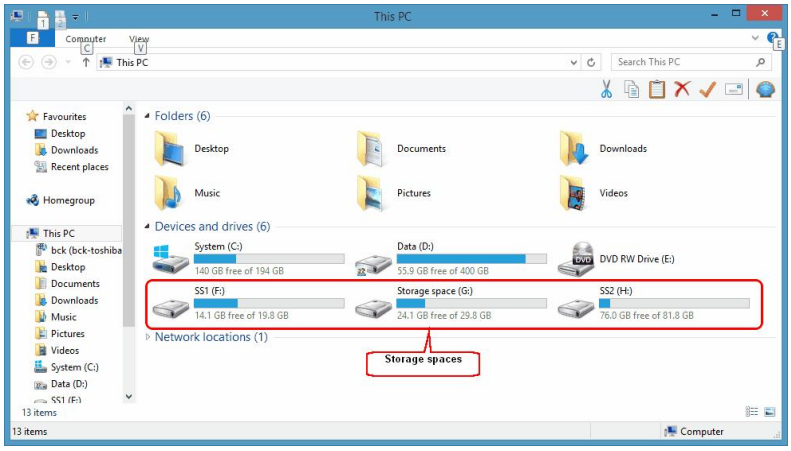
Storage pools and spaces is a new storage technology, introduced in Windows 8 and Windows Server 2012, that allows the user to combine various (not always similar) hard drives into a kind of a RAID or compound volume. First, the hard drives are combined into a storage pool, then several storage spaces with striping (similar to RAID0), mirroring (similar to RAID1), and parity (similar to RAID5) can be created in that storage pool. You may read more about storage pools and spaces in the Microsoft's Storage Spaces: FAQ.

When Windows storage spaces use caching, **R-Studio** can process both the cache and the storage space itself simultaneously greatly increasing chances for successful recovery of deleted files. For SSD (Solid State Device) media, bypassing the cache may be the only available option to recover lost files.

R-Studio supports Windows Storage Spaces created by Windows 8/8.1 and Windows 10.

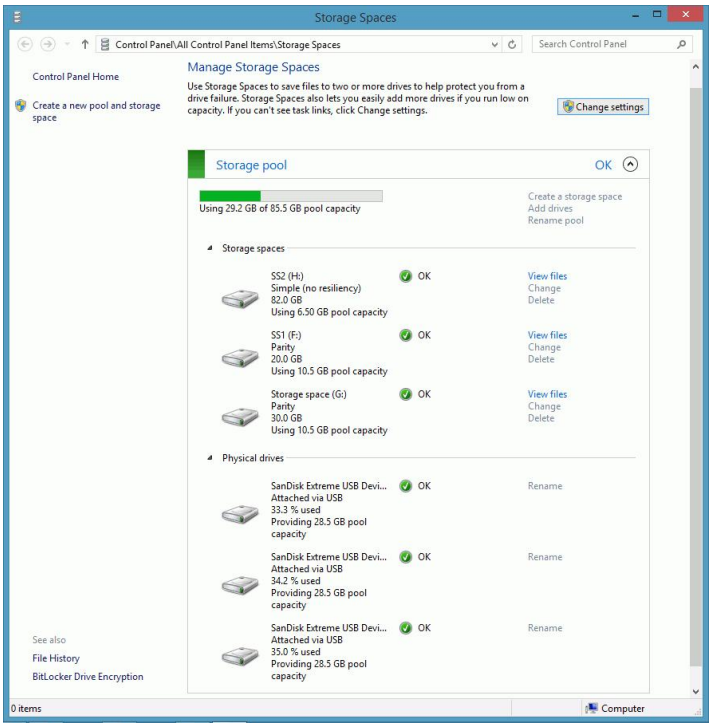
When drives from a storage pool are connected to a Windows computer, it automatically detects them and assembles storage spaces accordingly.

Storage spaces



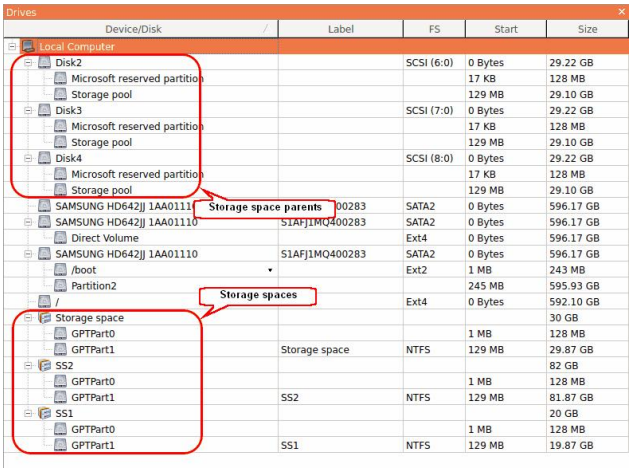
Storage pools and spaces can be managed using the **Storage Spaces** item in the **Control Panel**.

Storage spaces



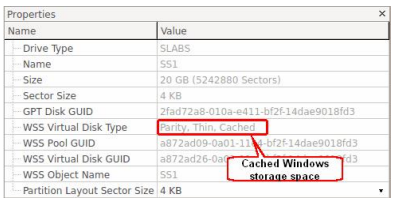
R-Studio automatically detects disks from storage pools and creates storage pools and spaces automatically. At the same time, **R-Studio** gives access to the parents of the storage spaces (hard drives and images).

Storage spaces in R-Studio


Drives
Device/Disk
Label
FS
Start
Size
Local Computer
Disk2 SCSI (6:0) 0 Bytes 29.22 GB
Microsoft reserved partition 17 KB 128 MB
Storage pool 129 MB 29.10 GB
Disk3 SCSI (7:0) 0 Bytes 29.22 GB
Microsoft reserved partition 17 KB 128 MB
Storage pool 129 MB 29.10 GB
Disk4 SCSI (8:0) 0 Bytes 29.22 GB
Microsoft reserved partition 17 KB 128 MB
Storage pool 129 MB 29.10 GB
Storage space parents
SAMSUNG HD642JJ 1AA0111 00283 SATA2 0 Bytes 596.17 GB
SAMSUNG HD642JJ 1AA01110 S1AFJ1MQ400283 SATA2 0 Bytes 596.17 GB
Direct Volume Ext4 0 Bytes 596.17 GB
SAMSUNG HD642JJ 1AA01110 S1AFJ1MQ400283 SATA2 0 Bytes 596.17 GB
/boot Ext2 1 MB 243 MB
Partition2 245 MB 595.93 GB
Storage spaces
/ Ext4 0 Bytes 592.10 GB
Storage space 30 GB
GPTPart0 1 MB 128 MB
GPTPart1 Storage space NTFS 129 MB 29.87 GB
SS2 82 GB
GPTPart0 1 MB 128 MB
GPTPart1 SS2 NTFS 129 MB 81.87 GB
SS1 20 GB
GPTPart0 1 MB 128 MB
GPTPart1 SS1 NTFS 129 MB 19.87 GB

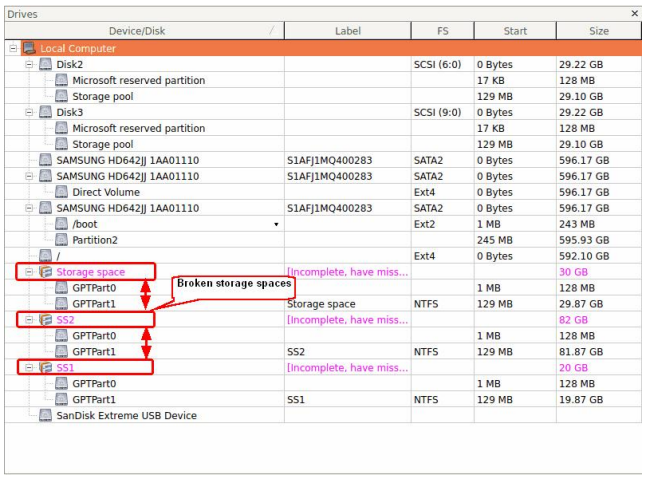
R-Studio indicates cached storage spaces in their Properties tab.

Cached storage space



R-Studio shows broken storage spaces in pink.

Broken storage spaces in R-Studio



If recognized parents of a storage space are added to **R-Studio** (including disk images), **R-Studio** automatically adds them to their respective storage spaces.

When storage space parents are such damaged that **R-Studio** cannot recognize them as parents of broken storage spaces, you may add them manually. Right-click the required storage space, select **Add missing disks** on the context menu and select the required object(s) on the Add missing disks dialog box.

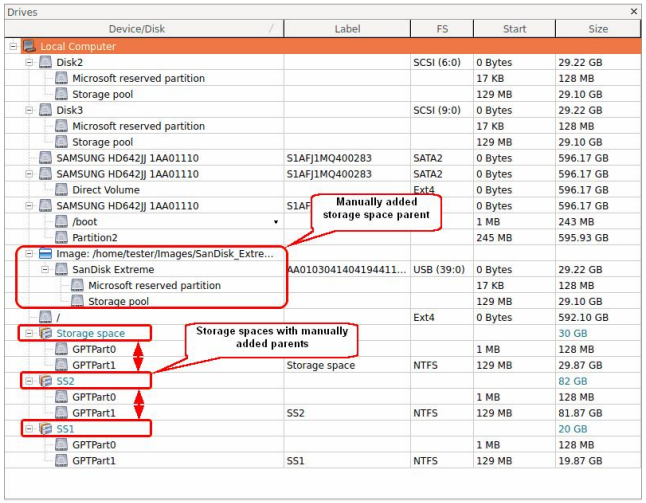
Add missing parent **dialog box**

Add missing disk (as superuser)
Missing disk 0: SanDisk Extreme USB Device (size: 28.50 GB)
[Choose correspondent disk]
OK
Cancel

You should place the objects on their correct places.

R-Studio shows such storage spaces in blue:

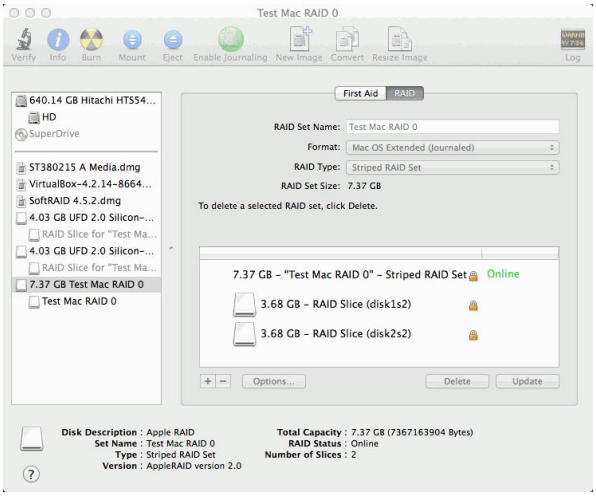
Storage spaces with added parents in R-Studio



2.4.8.2 Apple RAIDs

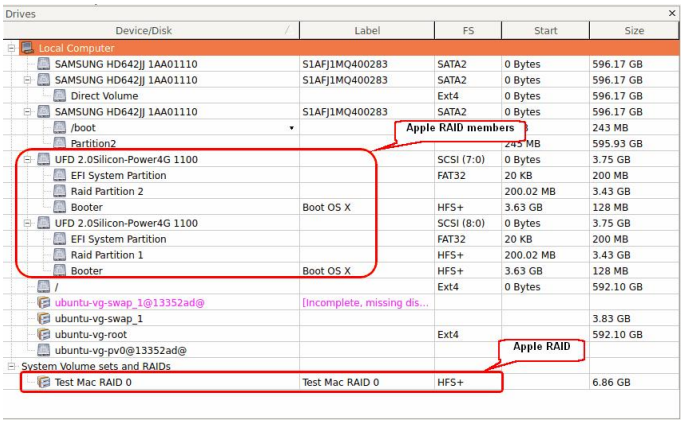
OS X can create several software RAIDs from disks connected to a Mac computer: RAID1 (Mirror set), RAID0 (Stripe set), and Concatenated disk set.

Apple RAID0 example



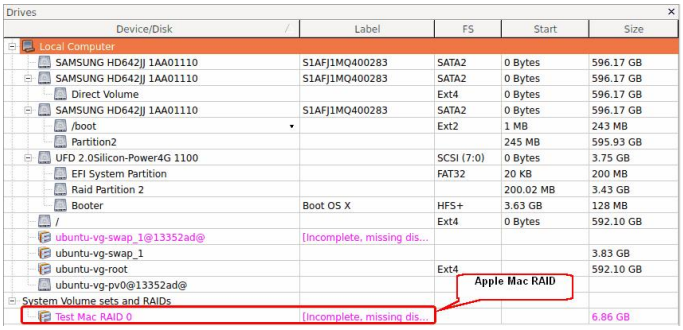
R-Studio automatically detects disks from Apple RAID sets and creates their virtual RAIDs automatically. At the same time, **R-Studio** gives access to the individual members of the Apple RAID sets (hard drives and images).

Apple RAIDs in R-Studio


Drives
Device/Disk
Label
FS
Start
Size
Local Computer
SAMSUNG HD642JJ 1AA01110 S1AFJ1MQ400283 SATA2 0 Bytes 596.17 GB
SAMSUNG HD642JJ 1AA01110 S1AFJ1MQ400283 SATA2 0 Bytes 596.17 GB
Direct Volume Ext4 0 Bytes 596.17 GB
SAMSUNG HD642JJ 1AA01110 S1AFJ1MQ400283 SATA2 0 Bytes 596.17 GB
/boot Ext2 1 MB 243 MB
Partition2 245 MB 595.93 GB
Apple RAID members
UFD 2.0Silicon-Power4G 1100 SCSI (7:0) 0 Bytes 3.75 GB
EFI System Partition FAT32 20 KB 200 MB
Raid Partition 2 200.02 MB 3.43 GB
Booter Boot OS X HFS+ 3.63 GB 128 MB
UFD 2.0Silicon-Power4G 1100 SCSI (8:0) 0 Bytes 3.75 GB
EFI System Partition FAT32 20 KB 200 MB
Raid Partition 1 HFS+ 200.02 MB 3.43 GB
Booter Boot OS X HFS+ 3.63 GB 128 MB
/ Ext4 0 Bytes 592.10 GB
ubuntu-vg-swap_1@13352ad@ [Incomplete, missing dis...
ubuntu-vg-swap_1 3.83 GB
ubuntu-vg-root Ext4 592.10 GB
ubuntu-vg-pv0@13352ad@
Apple RAID
System Volume sets and RAIDs
Test Mac RAID 0 Test Mac RAID 0 HFS+ 6.86 GB

R-Studio shows broken Apple RAIDs in pink.

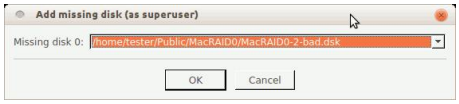
Broken Apple RAIDs in R-Studio


Drives
Device/Disk
Label
FS
Start
Size
Local Computer
SAMSUNG HD642JJ 1AA01110 S1AFJ1MQ400283 SATA2 0 Bytes 596.17 GB
SAMSUNG HD642JJ 1AA01110 S1AFJ1MQ400283 SATA2 0 Bytes 596.17 GB
Direct Volume Ext4 0 Bytes 596.17 GB
SAMSUNG HD642JJ 1AA01110 S1AFJ1MQ400283 SATA2 0 Bytes 596.17 GB
/boot Ext2 1 MB 243 MB
Partition2 245 MB 595.93 GB
UFD 2.0Silicon-Power4G 1100 SCSI (7:0) 0 Bytes 3.75 GB
EFI System Partition FAT32 20 KB 200 MB
Raid Partition 2 200.02 MB 3.43 GB
Booter Boot OS X HFS+ 3.63 GB 128 MB
/ Ext4 0 Bytes 592.10 GB
ubuntu-vg-swap_1@13352ad@ [Incomplete, missing dis...
ubuntu-vg-swap_1 3.83 GB
ubuntu-vg-root Ext4 592.10 GB
ubuntu-vg-pv0@13352ad@
Apple Mac RAID
System Volume sets and RAIDs
Test Mac RAID 0 [Incomplete, missing dis... 6.86 GB

If recognized members of a Apple RAID are added to **R-Studio** (including disk images), **R-Studio** automatically adds them to their respective Apple RAIDs.

When Apple RAID members are such damaged that **R-Studio** cannot recognize them as members of broken Apple RAIDs, you may add them manually. Right-click the required Apple RAID, select **Add missing disks** on the context menu and select the required object(s) on the Add missing disks dialog box.

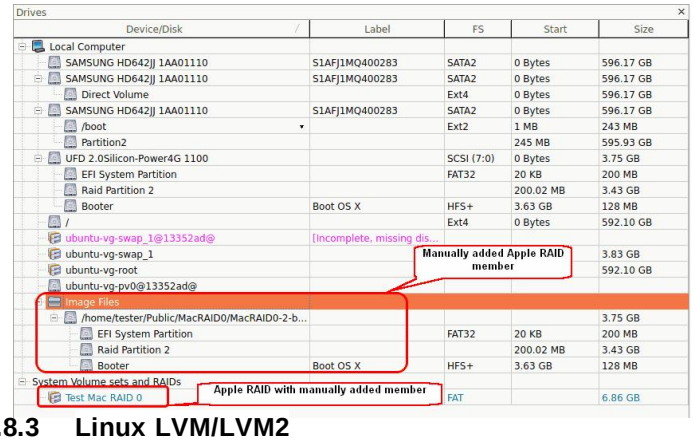
Add missing disk **dialog box**



You should place the objects on their correct places.

R-Studio shows such Apple RAIDs in blue:

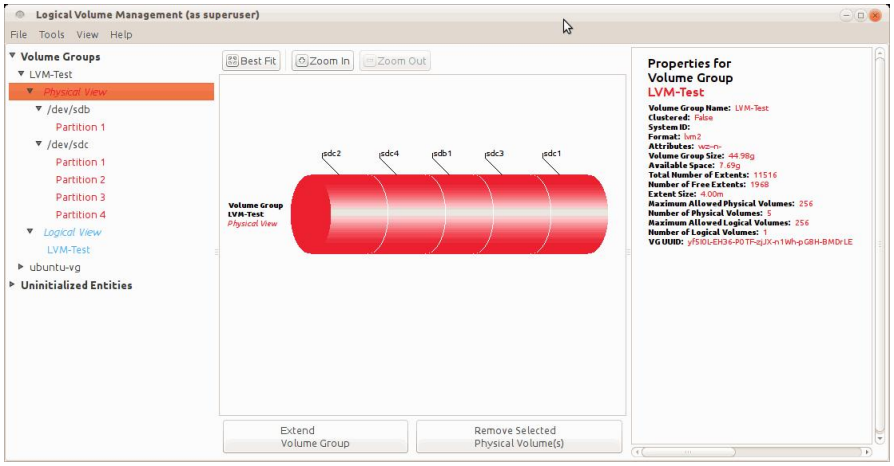
Apple RAIDs with added members in R-Studio



2.4.8.3 Linux LVM/LVM2

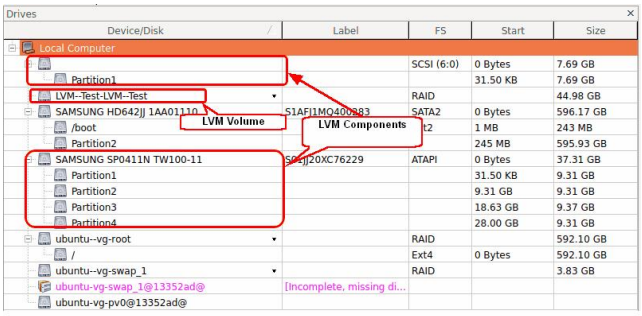
Linux LVM is a logical volume manager for the Linux OS that manages disk drives and other data storage devices. Using it, It is possible to create single logical volumes on several physical disks, add and replace them in a running system, resize logical volumes, create various RAID configuration, and so on. You may read more about Linux LVM on this Wikipedia article: Logical Volume Manager (Linux).

LVM volume example

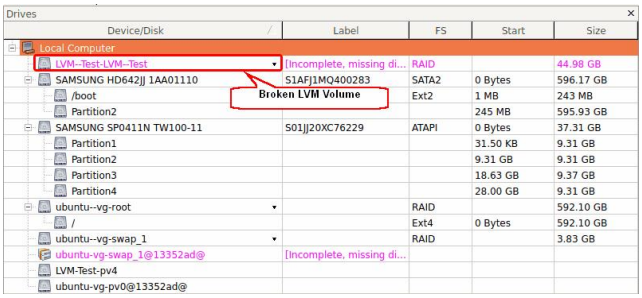


R-Studio automatically detects disks from LVMs and creates their virtual volumes automatically. At the same time, **R-Studio** gives access to the components of the virtual LVM volumes (hard drives and images).

LVM Volumes in R-Studio



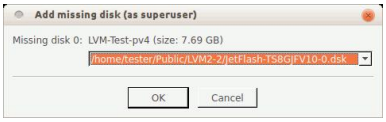
R-Studio shows broken virtual LVM volumes in pink. **Broken LVM volumes in R-Studio**



If recognized components of a virtual LVM volume are added to **R-Studio** (including disk images), **R-Studio** automatically adds them to their respective virtual LVM volumes.

When virtual LVM volume components are such damaged that **R-Studio** cannot recognize them as components of broken virtual LVM volumes, you may add them manually. Right-click the required virtual LVM volume, select **Add missing disks** on the context menu and select the required object(s) on the Add missing disk dialog box.

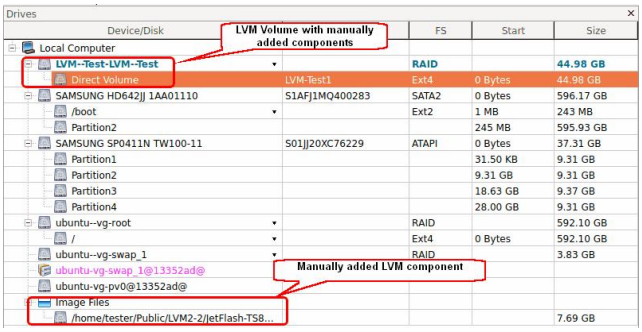
Add missing disk **dialog box**



You should place the objects on their correct places.

R-Studio shows such virtual LVM volumes in blue:

LVM volumes with added components in R-Studio



2.4.9 Finding RAID Parameters

R-Studio can find parameters for RAID 5 and 6. RAID parameters can be found automatically or manually.

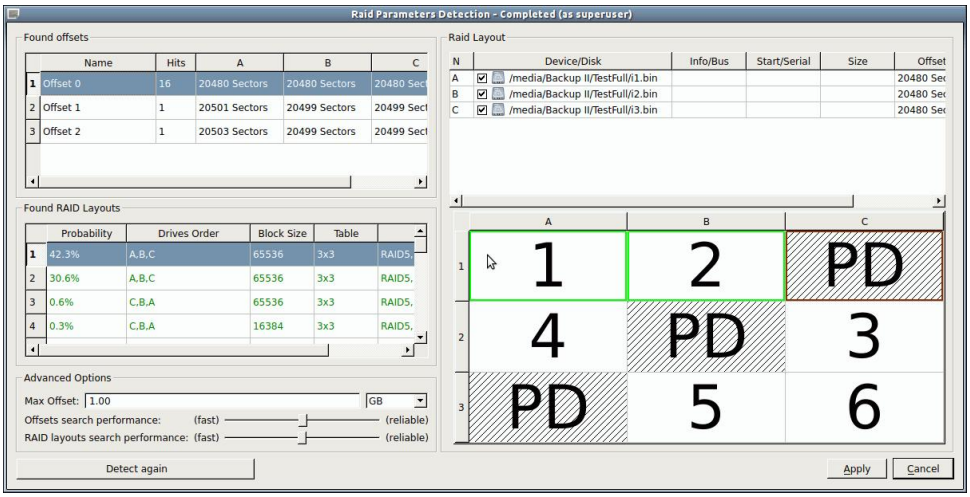
The number of disks in the RAID should be between 3 and 32. RAID parameters can be found only when all original disks (or their images) are present. Even one substitute object in a RAID (like a missing disk) makes finding RAID parameters impossible.

To find RAID parameters automatically,

1 **Click the Auto Detect button on the** Parents **tab**

> **R-Studio will start searching for the RAID parameters and show the most probable one on the** RAID Parameter Detection **dialog box**

RAID Parameter Detection **dialog box**



2 **Click the Apply button and R-Studio will change the RAID layout to the selected one on the** Parents **tab.**

3 **Click the Apply button on the** Parents **tab**

> **R-Studio will use the found parameters for the RAID.**

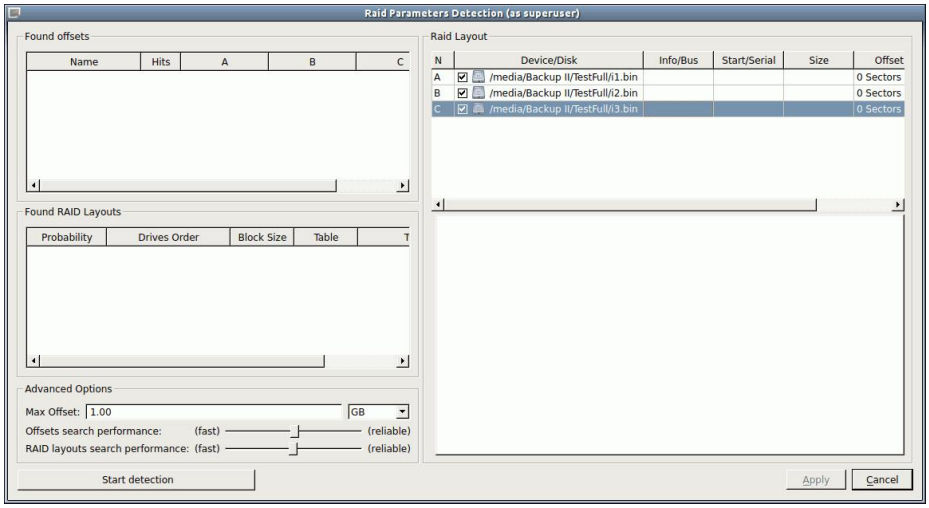
If necessary, you may return to the RAID Parameter Detection dialog box by clicking the **Choose Variants** button, and select another RAID layout.

To find RAID parameters manually,

1 **Click the drop-down Auto Detect list on the** Parents **tab and select Advanced Detection.**

2 Specify the necessary detection parameters on the RAID Parameter Detection **dialog box and click the Start detection button**

Raid Parameters Detection **dialog box**



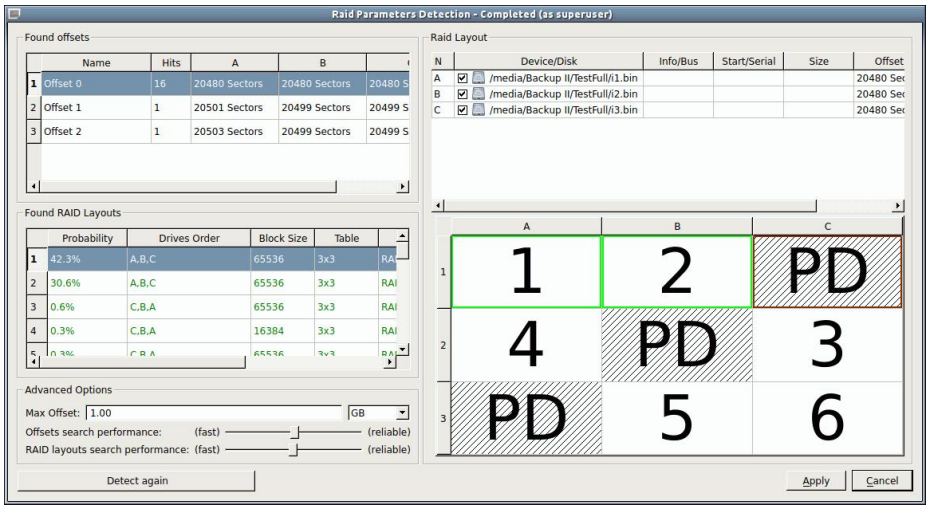
You may change the disk order, offset for disk(s), and enable /disable disks.

Advanced Parameters

Max offset:	The area on the disk to find RAID parameters in.
Offset search performance RAID layouts search performance	Cumulative parameters that estimates the probability of certain found RAID parameters. Moving it to the right increases accuracy but slows the process. Moving it to the left reduces the accuracy but makes the process faster.

3 Select an offset and click the Click here to find RAID Layouts button on the RAID Layout Autodetect **dialog box**

RAID Parameters Detection **dialog box**



You may add your own RAID offsets. Right-click empty space on the **Found offsets** pane and select **Add Custom offset** on the context menu and specify the offset individually for every disk.

4 Select a RAID variant on the Found RAID layouts pane and click the Apply button

5 Click the Apply button on the Parents tab

> **R-Studio will use the found parameters for the RAID.**

If necessary, you may return to the RAID Parameter Detection dialog box by clicking the **Choose Variants** button, and select another RAID layout.

2.4.10 Checking RAID Consistency

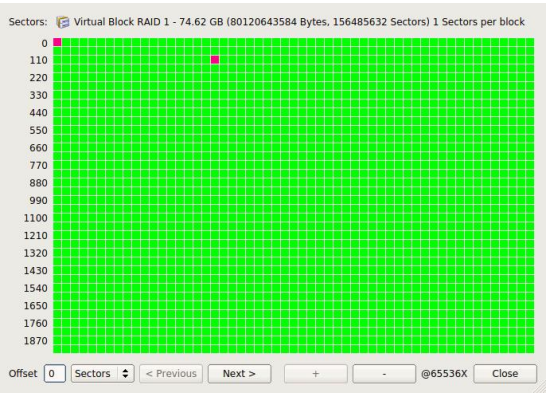
You may check RAID consistency (whether the data parity values are valid) for RAID layouts with parity blocks.

To check RAID consistency,

* **Right-click the RAID and select Check RAID consistency... on the context menu**

> **The RAID consistency check window will appear showing the progress.**

RAID consistency check **window**



When the check is finished, you may inspect the results.

Block color	
Green	Data parity values are valid.
Red	Data parity values are not valid.
White	0's

When a mouse pointer hovers over a block, a tooltip will show the sector range within the block and number of consistent and inconsistent sectors. Double-clicking the block moves it to the upper-leftmost corner and zooms in the data by 2.

RAID consistency check controls

Sectors	The number of the first sector in the row.
Offset	Offset in the data. Enter the address you want to jump to and press the **Enter** key.
Sectors/Bytes/KB...	Specifies the dimension of the data in the **Offset** field.
Previous/Next	Moves to the previous/next part of the data.
+/-	Zooms into/out of, the data.

2.4.11 Syntax of a Description File for RAID Configurations

You may create and store your own RAID configurations The syntax of those files is similar to that of the XML language. They are stored in an `.xml` file specified on the **R-Studio Settings**.

A number of file examples are shown on the **Description Files for RAID Configurations** topic.

RAID configuration file example

```
<RAIDList>
  <RAID name="RAID6Complex" parents="5" rows="6" blocksize="16777216">
    <Table>
      <Block id="A1">ReedSolomon</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="D1">3</Block>
      <Block id="E1">XorOfData</Block>
      <Block id="A2">4</Block>
      <Block id="B2">5</Block>
      <Block id="C2">6</Block>
      <Block id="D2">XorOfData</Block>
      <Block id="E2">ReedSolomon</Block>
      <Block id="A3">8</Block>
      <Block id="B3">9</Block>
      <Block id="C3">XorOfData</Block>
      <Block id="D3">ReedSolomon</Block>
      <Block id="E3">7</Block>
      <Block id="A4">12</Block>
      <Block id="B4">XorOfData</Block>
      <Block id="C4">ReedSolomon</Block>
      <Block id="D4">10</Block>
      <Block id="E4">11</Block>
      <Block id="A5">XorOfData</Block>
      <Block id="B5">ReedSolomon</Block>
      <Block id="C5">13</Block>
      <Block id="D5">14</Block>
      <Block id="E5">15</Block>
      <Block id="A6" sequence="1">XorOfAll</Block>
      <Block id="B6" sequence="2">XorOfAll</Block>
      <Block id="C6" sequence="3">XorOfAll</Block>
      <Block id="D6" sequence="4">XorOfAll</Block>
      <Block id="E6" sequence="5">XorOfAll</Block>
    </Table>
    <Sequences>
      <Sequence id="1">A1 A2 A3 A4 A5 A6</Sequence>
      <Sequence id="2">B1 B2 B3 B4 B5 B6</Sequence>
      <Sequence id="3">C1 C2 C3 C4 C5 C6</Sequence>
      <Sequence id="4">D1 D2 D3 D4 D5 D6</Sequence>
      <Sequence id="5">E1 E2 E3 E4 E5 E6</Sequence>
    </Sequences>
  </RAID>
</RAIDList>
```

File structure

File header

The file starts with a standard XML header:

```
<?xml version="1.0" encoding="utf-8"?>
```

Section `RAIDList`

```
<RAIDList>
```

It can contain any number of the `<RAID>` sections and requires a closing element `</FileTypeList>`.

Section structure example:

```
<RAIDList>
  <RAID [attributes]>
    ...
  </RAID>
  ...
  <RAID [attributes]>
    ...
  </RAID>
```

Section `RAID`

This section describes each RAID layout.

It must contain at least one `<Table>` section and can contain one block `<Sequences>` and one block `<Offsets>`.

Attributes:

`name`	`<string>`	Optional	The name of the RAID layout
`parents`	`<u16>`	Required	The number of parent objects
`rows`	`<u16>`	Required	The number of rows in the RAID layout table.
`blocksize`	`<u32>`	Required	The block size of the RAID in bytes.

Section structure example:

```
<RAIDList>
  <RAID name="example" parents="2" rows="2" blocksize="16777216">
    <Table>
      ...
    </Table>
    <Sequences>
      ...
    </Sequences>
    <Offsets>
      ...
    </Offsets>
  </RAID>
</RAIDList>
```

Section `Table`

This section describes the RAID layout table. It contains the `<Block>` elements which number is a product of two attributes in the `<RAID>` section: `<parents>` x `<rows>`.

Section structure example:

```
<RAIDList>
  <RAID name="example" parents="2" rows="2" blocksize="16777216">
    <Table>
      <Block [attributes]> ... </Block>
      <Block [attributes]> ... </Block>
      <Block [attributes]> ... </Block>
      <Block [attributes]> ... </Block>
    </Table>
  </RAID>
</RAIDList>
```

Element `Block`

The element specifies the block number in the RAID layout table (a positive integer number) or an error correction block of the following types:

- `PD` or `ParityOfData`
- `PA` or `ParityOfAll`
- `RS` or `ReedSolomon`
- `U` or `Unknown`
- `I` or `Ignore`

Any other value is treated as `Unknown`.

Attributes:

`id`	`<string>`	Required	The alpha-numerical identifier of the block in the RAID layout table. The element in the 3-rd column of the 2-nd line is designated as `C2`. `AA` is used after letter `Z`, and so on.
`sequence`	`<u16>` or `row`	Optional	The identifier of a sequence. The attribute should be specified only for checksum blocks of the sequences described in the `<Sequences>` section. Default: `row`

Section `Sequences`

This section describes the data checksum sequences used to preserve data integrity. It can contain any number of the `<Sequence>` elements.

Section structure example:

```
<RAIDList>
  <RAID name="example" parents="4" rows="4" blocksize="16777216">
    <Table>
      ...
    </Table>
    <Sequences>
      <Sequence [attributes]> ... </Sequence>
      ...
      <Sequence [attributes]> ... </Sequence>
    </Sequences>
  </RAID>
</RAIDList>
```

Element `Sequence`

The element contains the list of the RAID blocks separated by a space which belong to that sequence.

Attributes:

`id`	`<u16>`	Required	The sequence identifier.

Element example:

See the **RAID configuration file example**.

Section `Offsets`

This section describes the offsets of each parent object.. It contains the `<Offset>` elements which number should not exceed the value of the `parents` attribute of the `<RAID>` section. If the `<Offsets>` section is absent, offsets are treated as zero.

Section structure example:

```
<RAIDList>
  <RAID name="example" parents="4" rows="4" blocksize="16777216">
    <Table>
      ...
    </Table>
    <Offsets>
      <Offset [attributes]> ... </Offset>
      <Offset [attributes]> ... </Offset>
      <Offset [attributes]> ... </Offset>
      <Offset [attributes]> ... </Offset>
    </Offsets>
  </RAID>
</RAIDList>
```

Element `Offset`

The element specifies the offset of a RAID parent in bytes.

Attributes:

`id`	`<u16>`	Required	The RAID parent identifier. (from 1 to the `parents` attribute of the `<RAID>` section.)

Element example:

```
<RAIDList>
  <RAID name="example" parents="4" rows="4" blocksize="16777216">
    <Table>
      ...
    </Table>
    <Offsets>
      <Offset id="1"> 0x00100</Offset>
      <Offset id="3"> 0x01000</Offset>
    </Offsets>
  </RAID>
</RAIDList>
```

Comments

```
<!-- Comment string -->
```

An XML standard string for a comment.

2.4.12 Description Files for RAID Configurations

Below are description files for RAID examples described in the **Volume Sets and RAIDs** chapter. The syntax of them is described in the **Syntax of a Description File for RAID Configurations** topic.

StripeSet

The stripe set layout is described in the **Volume Sets, Stripe Sets, and Mirrors** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID name="StripeSet" parents="2" rows="2" blocksize="16777216">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">2</Block>
      <Block id="A2">3</Block>
      <Block id="B2">4</Block>
```

```
    </Table>
  </RAID>
</RAIDList>
```

Basic RAID 5

The RAID layout is described in the **Working with Basic RAID 4 and RAID 5 Operations** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID name="RAID5Layout" parents="3" rows="3" blocksize="16777216">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">2</Block>
      <Block id="C1">XorOfData</Block>
      <Block id="A2">3</Block>
      <Block id="B2">XorOfData</Block>
      <Block id="C2">4</Block>
      <Block id="A3">XorOfData</Block>
      <Block id="B3">5</Block>
      <Block id="C3">6</Block>
    </Table>
  </RAID>
</RAIDList>
```

RAID 5 with parity delays

The RAID layout is described in the **RAID5 with Parity Delays Operations** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="16384" name="RAID5Delay" parents="3" rows="48">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">2</Block>
      <Block id="C1">XorOfData</Block>
      <Block id="A2">3</Block>
      <Block id="B2">4</Block>
      <Block id="C2">XorOfData</Block>
      <Block id="A3">5</Block>
      <Block id="B3">6</Block>
      <Block id="C3">XorOfData</Block>
      <Block id="A4">7</Block>
      <Block id="B4">8</Block>
      <Block id="C4">XorOfData</Block>
      <Block id="A5">9</Block>
      <Block id="B5">10</Block>
      <Block id="C5">XorOfData</Block>
      <Block id="A6">11</Block>
      <Block id="B6">12</Block>
      <Block id="C6">XorOfData</Block>
      <Block id="A7">13</Block>
      <Block id="B7">14</Block>
      <Block id="C7">XorOfData</Block>
      <Block id="A8">15</Block>
      <Block id="B8">16</Block>
      <Block id="C8">XorOfData</Block>
      <Block id="A9">17</Block>
```

```
<Block id="B9">18</Block>
<Block id="C9">XorOfData</Block>
<Block id="A10">19</Block>
<Block id="B10">20</Block>
<Block id="C10">XorOfData</Block>
<Block id="A11">21</Block>
<Block id="B11">22</Block>
<Block id="C11">XorOfData</Block>
<Block id="A12">23</Block>
<Block id="B12">24</Block>
<Block id="C12">XorOfData</Block>
<Block id="A13">25</Block>
<Block id="B13">26</Block>
<Block id="C13">XorOfData</Block>
<Block id="A14">27</Block>
<Block id="B14">28</Block>
<Block id="C14">XorOfData</Block>
<Block id="A15">29</Block>
<Block id="B15">30</Block>
<Block id="C15">XorOfData</Block>
<Block id="A16">31</Block>
<Block id="B16">32</Block>
<Block id="C16">XorOfData</Block>
<Block id="A17">33</Block>
<Block id="B17">XorOfData</Block>
<Block id="C17">34</Block>
<Block id="A18">35</Block>
<Block id="B18">XorOfData</Block>
<Block id="C18">36</Block>
<Block id="A19">37</Block>
<Block id="B19">XorOfData</Block>
<Block id="C19">38</Block>
<Block id="A20">39</Block>
<Block id="B20">XorOfData</Block>
<Block id="C20">40</Block>
<Block id="A21">41</Block>
<Block id="B21">XorOfData</Block>
<Block id="C21">42</Block>
<Block id="A22">43</Block>
<Block id="B22">XorOfData</Block>
<Block id="C22">44</Block>
<Block id="A23">45</Block>
<Block id="B23">XorOfData</Block>
<Block id="C23">46</Block>
<Block id="A24">47</Block>
<Block id="B24">XorOfData</Block>
<Block id="C24">48</Block>
<Block id="A25">49</Block>
<Block id="B25">XorOfData</Block>
<Block id="C25">50</Block>
<Block id="A26">51</Block>
<Block id="B26">XorOfData</Block>
<Block id="C26">52</Block>
```

```
<Block id="A27">53</Block>
<Block id="B27">XorOfData</Block>
<Block id="C27">54</Block>
<Block id="A28">55</Block>
<Block id="B28">XorOfData</Block>
<Block id="C28">56</Block>
<Block id="A29">57</Block>
<Block id="B29">XorOfData</Block>
<Block id="C29">58</Block>
<Block id="A30">59</Block>
<Block id="B30">XorOfData</Block>
<Block id="C30">60</Block>
<Block id="A31">61</Block>
<Block id="B31">XorOfData</Block>
<Block id="C31">62</Block>
<Block id="A32">63</Block>
<Block id="B32">XorOfData</Block>
<Block id="C32">64</Block>
<Block id="A33">XorOfData</Block>
<Block id="B33">65</Block>
<Block id="C33">66</Block>
<Block id="A34">XorOfData</Block>
<Block id="B34">67</Block>
<Block id="C34">68</Block>
<Block id="A35">XorOfData</Block>
<Block id="B35">69</Block>
<Block id="C35">70</Block>
<Block id="A36">XorOfData</Block>
<Block id="B36">71</Block>
<Block id="C36">72</Block>
<Block id="A37">XorOfData</Block>
<Block id="B37">73</Block>
<Block id="C37">74</Block>
<Block id="A38">XorOfData</Block>
<Block id="B38">75</Block>
<Block id="C38">76</Block>
<Block id="A39">XorOfData</Block>
<Block id="B39">77</Block>
<Block id="C39">78</Block>
<Block id="A40">XorOfData</Block>
<Block id="B40">79</Block>
<Block id="C40">80</Block>
<Block id="A41">XorOfData</Block>
<Block id="B41">81</Block>
<Block id="C41">82</Block>
<Block id="A42">XorOfData</Block>
<Block id="B42">83</Block>
<Block id="C42">84</Block>
<Block id="A43">XorOfData</Block>
<Block id="B43">85</Block>
<Block id="C43">86</Block>
<Block id="A44">XorOfData</Block>
<Block id="B44">87</Block>
```

```
      <Block id="C44">88</Block>
      <Block id="A45">XorOfData</Block>
      <Block id="B45">89</Block>
      <Block id="C45">90</Block>
      <Block id="A46">XorOfData</Block>
      <Block id="B46">91</Block>
      <Block id="C46">92</Block>
      <Block id="A47">XorOfData</Block>
      <Block id="B47">93</Block>
      <Block id="C47">94</Block>
      <Block id="A48">XorOfData</Block>
      <Block id="B48">95</Block>
      <Block id="C48">96</Block>
    </Table>
    <Offsets>
      <Offset id="1">557056</Offset>
      <Offset id="2">557056</Offset>
      <Offset id="3">557056</Offset>
    </Offsets>
  </RAID>
</RAIDList>
```

Advanced RAID 5

The RAID layout is described in the **Working with Advanced RAID Layouts** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID name="RAID5Complex" parents="3" rows="9" blocksize="16777216">
    <Table>
      <Block id="A1">XorOfData</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="A2">XorOfData</Block>
      <Block id="B2">3</Block>
      <Block id="C2">4</Block>
      <Block id="A3">XorOfData</Block>
      <Block id="B3">5</Block>
      <Block id="C3">6</Block>
      <Block id="A4">7</Block>
      <Block id="B4">XorOfData</Block>
      <Block id="C4">8</Block>
      <Block id="A5">10</Block>
      <Block id="B5">XorOfData</Block>
      <Block id="C5">9</Block>
      <Block id="A6">11</Block>
      <Block id="B6">XorOfData</Block>
      <Block id="C6">12</Block>
      <Block id="A7">13</Block>
      <Block id="B7">14</Block>
      <Block id="C7">XorOfData</Block>
      <Block id="A8">15</Block>
      <Block id="B8">16</Block>
      <Block id="C8">XorOfData</Block>
      <Block id="A9">17</Block>
```

```
      <Block id="B9">18</Block>
      <Block id="C9">XorOfData</Block>
    </Table>
    <Offsets>
      <Offset id="1">16777216</Offset>
      <Offset id="2">16777216</Offset>
      <Offset id="3">16777216</Offset>
    </Offsets>
  </RAID>
</RAIDList>
```

Advanced RAID

The RAID layout is described in the **Working with Advanced RAID Layouts** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="524288" name="RAID5_MAC_Pro" parents="4" rows="3">
    <Table>
      <Block id="A1" sequence="1">XorOfData</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="D1" sequence="2">XorOfData</Block>
      <Block id="A2">3</Block>
      <Block id="B2">4</Block>
      <Block id="C2" sequence="3">XorOfData</Block>
      <Block id="D2">5</Block>
      <Block id="A3">6</Block>
      <Block id="B3" sequence="4">XorOfData</Block>
      <Block id="C3">7</Block>
      <Block id="D3">8</Block>
    </Table>
    <Sequences>
      <Sequence id="1">A1 B1 C1</Sequence>
      <Sequence id="2">D1 A2 B2</Sequence>
      <Sequence id="3">C2 D2 A3</Sequence>
      <Sequence id="4">B3 C3 D3</Sequence>
    </Sequences>
    <Offsets>
      <Offset id="1">16777216</Offset>
      <Offset id="2">16777216</Offset>
      <Offset id="3">16777216</Offset>
      <Offset id="4">16777216</Offset>
    </Offsets>
  </RAID>
</RAIDList>
```

RAID 6 Reed-Solomon (Left Synchronous (Standard)) Preset

The RAID layout is described in the **Working with RAID 6 Presets** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID name="RAID6RS" parents="5" rows="5" blocksize="16777216">
    <Table>
      <Block id="A1">ReedSolomon</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
```

```
      <Block id="D1">3</Block>
      <Block id="E1">XorOfData</Block>
      <Block id="A2">4</Block>
      <Block id="B2">5</Block>
      <Block id="C2">6</Block>
      <Block id="D2">XorOfData</Block>
      <Block id="E2">ReedSolomon</Block>
      <Block id="A3">8</Block>
      <Block id="B3">9</Block>
      <Block id="C3">XorOfData</Block>
      <Block id="D3">ReedSolomon</Block>
      <Block id="E3">7</Block>
      <Block id="A4">12</Block>
      <Block id="B4">XorOfData</Block>
      <Block id="C4">ReedSolomon</Block>
      <Block id="D4">10</Block>
      <Block id="E4">11</Block>
      <Block id="A5">XorOfData</Block>
      <Block id="B5">ReedSolomon</Block>
      <Block id="C5">13</Block>
      <Block id="D5">14</Block>
      <Block id="E5">15</Block>
    </Table>
  </RAID>
</RAIDList>
```

Advanced RAID 6

The RAID layout is described in the **Working with Advanced RAID Layouts** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID name="RAID6Complex" parents="5" rows="6" blocksize="16777216">
    <Table>
      <Block id="A1">ReedSolomon</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="D1">3</Block>
      <Block id="E1">XorOfData</Block>
      <Block id="A2">4</Block>
      <Block id="B2">5</Block>
      <Block id="C2">6</Block>
      <Block id="D2">XorOfData</Block>
      <Block id="E2">ReedSolomon</Block>
      <Block id="A3">8</Block>
      <Block id="B3">9</Block>
      <Block id="C3">XorOfData</Block>
      <Block id="D3">ReedSolomon</Block>
      <Block id="E3">7</Block>
      <Block id="A4">12</Block>
      <Block id="B4">XorOfData</Block>
      <Block id="C4">ReedSolomon</Block>
      <Block id="D4">10</Block>
      <Block id="E4">11</Block>
      <Block id="A5">XorOfData</Block>
```

```
      <Block id="B5">ReedSolomon</Block>
      <Block id="C5">13</Block>
      <Block id="D5">14</Block>
      <Block id="E5">15</Block>
      <Block id="A6" sequence="1">XorOfAll</Block>
      <Block id="B6" sequence="2">XorOfAll</Block>
      <Block id="C6" sequence="3">XorOfAll</Block>
      <Block id="D6" sequence="4">XorOfAll</Block>
      <Block id="E6" sequence="5">XorOfAll</Block>
    </Table>
    <Sequences>
      <Sequence id="1">A1 A2 A3 A4 A5 A6</Sequence>
      <Sequence id="2">B1 B2 B3 B4 B5 B6</Sequence>
      <Sequence id="3">C1 C2 C3 C4 C5 C6</Sequence>
      <Sequence id="4">D1 D2 D3 D4 D5 D6</Sequence>
      <Sequence id="5">E1 E2 E3 E4 E5 E6</Sequence>
    </Sequences>
  </RAID>
</RAIDList>
```

RAID10 (1+0)

The RAID layout is described in the **RAID10 (1+0)** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="65536" name="RAID10" parents="4" rows="1">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="D1">2</Block>
    </Table>
  </RAID>
</RAIDList>
```

RAID1E

The RAID layout is described in the **RAID1E** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="65536" name="raid1e" parents="3" rows="2">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="A2">2</Block>
      <Block id="B2">3</Block>
      <Block id="C2">3</Block>
    </Table>
  </RAID>
</RAIDList>
```

RAID5E

The RAID layout is described in the **RAID5E** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
```

```
  <RAID blockSize="65536" name="RAID5E" parents="4" rows="5">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">2</Block>
      <Block id="C1">3</Block>
      <Block id="D1">XorOfData</Block>
      <Block id="A2">5</Block>
      <Block id="B2">6</Block>
      <Block id="C2">XorOfData</Block>
      <Block id="D2">4</Block>
      <Block id="A3">9</Block>
      <Block id="B3">XorOfData</Block>
      <Block id="C3">7</Block>
      <Block id="D3">8</Block>
      <Block id="A4">XorOfData</Block>
      <Block id="B4">10</Block>
      <Block id="C4">11</Block>
      <Block id="D4">12</Block>
      <Block id="A5">Ignore</Block>
      <Block id="B5">Ignore</Block>
      <Block id="C5">Ignore</Block>
      <Block id="D5">Ignore</Block>
    </Table>
  </RAID>
</RAIDList>
```

RAID5EE

The RAID layout is described in the **RAID5EE** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="65536" name="raid5ee" parents="4" rows="4">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">2</Block>
      <Block id="C1">Ignore</Block>
      <Block id="D1">XorOfData</Block>
      <Block id="A2">4</Block>
      <Block id="B2">Ignore</Block>
      <Block id="C2">XorOfData</Block>
      <Block id="D2">3</Block>
      <Block id="A3">Ignore</Block>
      <Block id="B3">XorOfData</Block>
      <Block id="C3">5</Block>
      <Block id="D3">6</Block>
      <Block id="A4">XorOfData</Block>
      <Block id="B4">7</Block>
      <Block id="C4">8</Block>
      <Block id="D4">Ignore</Block>
    </Table>
  </RAID>
</RAIDList>
```

RAID6E

The RAID layout is described in the **RAID6E** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
<RAIDList>
  <RAID blockSize="65536" name="raid6e" parents="6" rows="7">
    <Table>
      <Block id="A1">ReedSolomon</Block>
      <Block id="B1">1</Block>
      <Block id="C1">2</Block>
      <Block id="D1">3</Block>
      <Block id="E1">4</Block>
      <Block id="F1">XorOfData</Block>
      <Block id="A2">5</Block>
      <Block id="B2">6</Block>
      <Block id="C2">7</Block>
      <Block id="D2">8</Block>
      <Block id="E2">XorOfData</Block>
      <Block id="F2">ReedSolomon</Block>
      <Block id="A3">10</Block>
      <Block id="B3">11</Block>
      <Block id="C3">12</Block>
      <Block id="D3">XorOfData</Block>
      <Block id="E3">ReedSolomon</Block>
      <Block id="F3">9</Block>
      <Block id="A4">15</Block>
      <Block id="B4">16</Block>
      <Block id="C4">XorOfData</Block>
      <Block id="D4">ReedSolomon</Block>
      <Block id="E4">13</Block>
      <Block id="F4">14</Block>
      <Block id="A5">20</Block>
      <Block id="B5">XorOfData</Block>
      <Block id="C5">ReedSolomon</Block>
      <Block id="D5">17</Block>
      <Block id="E5">18</Block>
      <Block id="F5">19</Block>
      <Block id="A6">XorOfData</Block>
      <Block id="B6">ReedSolomon</Block>
      <Block id="C6">21</Block>
      <Block id="D6">22</Block>
      <Block id="E6">23</Block>
      <Block id="F6">24</Block>
      <Block id="A7">Ignore</Block>
      <Block id="B7">Ignore</Block>
      <Block id="C7">Ignore</Block>
      <Block id="D7">Ignore</Block>
      <Block id="E7">Ignore</Block>
      <Block id="F7">Ignore</Block>
    </Table>
  </RAID>
</RAIDList>
```

RAID6 (Double Xor)

The RAID layout is described in the **Working with RAID6 (Double Xor) Presets** topic.

```
<?xml version="1.0" encoding="UTF-8" ?>
```

```
<RAIDList>
  <RAID blockSize="65536" name="RAID62X" parents="6" rows="4">
    <Table>
      <Block id="A1">1</Block>
      <Block id="B1">2</Block>
      <Block id="C1">3</Block>
      <Block id="D1">4</Block>
      <Block id="E1">XorOfData</Block>
      <Block id="F1" sequence="1">XorOfData</Block>
      <Block id="A2">5</Block>
      <Block id="B2">6</Block>
      <Block id="C2">7</Block>
      <Block id="D2">8</Block>
      <Block id="E2">XorOfData</Block>
      <Block id="F2" sequence="2">XorOfData</Block>
      <Block id="A3">9</Block>
      <Block id="B3">10</Block>
      <Block id="C3">11</Block>
      <Block id="D3">12</Block>
      <Block id="E3">XorOfData</Block>
      <Block id="F3" sequence="3">XorOfData</Block>
      <Block id="A4">13</Block>
      <Block id="B4">14</Block>
      <Block id="C4">15</Block>
      <Block id="D4">16</Block>
      <Block id="E4">XorOfData</Block>
      <Block id="F4" sequence="4">XorOfData</Block>
    </Table>
    <Sequences>
      <Sequence id="1">A1 F1 D2 C3 D3 B4 C4</Sequence>
      <Sequence id="2">B1 A2 D2 F2 C3 B4 D4</Sequence>
      <Sequence id="3">C1 B2 D2 A3 C3 F3 B4</Sequence>
      <Sequence id="4">D1 C2 D2 B3 C3 A4 B4 F4</Sequence>
    </Sequences>
  </RAID>
</RAIDList>
```

2.4.13 Reverse RAIDs

Reverse RAIDs is a technique that is reverse to creating virtual RAIDs. When creating a reverse RAID, the data from a real object is decomposed into virtual parents.Then data on those virtual parents can be processed like on real objects. They can be viewed, edited, imaged, copied to physical drives, etc.

- **Reverse RAID of an Object**
  This technique can be used to decompose data on a single volume into virtual parents. Then such virtual parents can be processed like on real objects. They can be viewed, edited, imaged, copied to physical drives, etc.
- **Reverse RAID of a RAID**
  This technique can be used to re-construct data on individual RAID disks when data on physical disks is corrupted, but can be recovered using RAID redundancy. A missing disk is an example of this case. Or if there are bad sectors scattered over the physical disks but the overall RAID integrity remains. Then the data can be copied to physical hard drives to create a healthy RAID.

Note: Many controllers write their own metadata to disks to recognize that the disks belong to certains RAIDs. Without that metadata they won't see those RAIDs. You have to write that metadata manually.

2.4.13.1 Reverse RAID of an Object

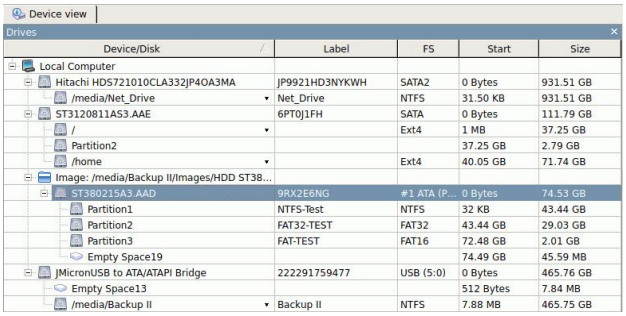
This technique can be used to decompose data on a single object into virtual parents. Then such virtual parents can be processed like on real objects. They can be viewed, edited, imaged, copied to physical drives, etc.

Suppose you have an image of a former RAID 6 (Reed-Solomon) and you wand to re-create data on individual disks from that RAID 6. You can do that by creating a reverse RAID of an image.

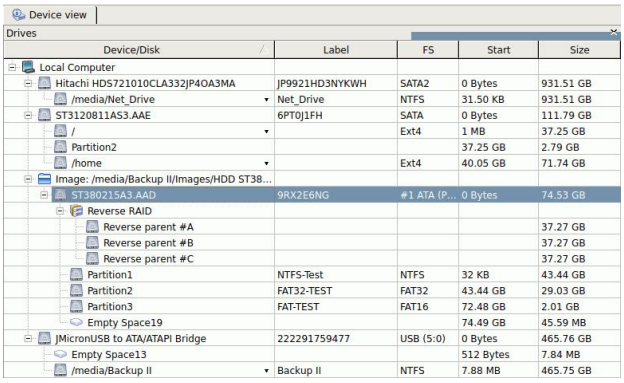
Note: Many controllers write their own metadata to disks to recognize that the disks belong to certains RAIDs. Without that metadata they won't see those RAIDs. You have to write that metadata manually.

To create a reverse RAID of a disk image (or other disk object),

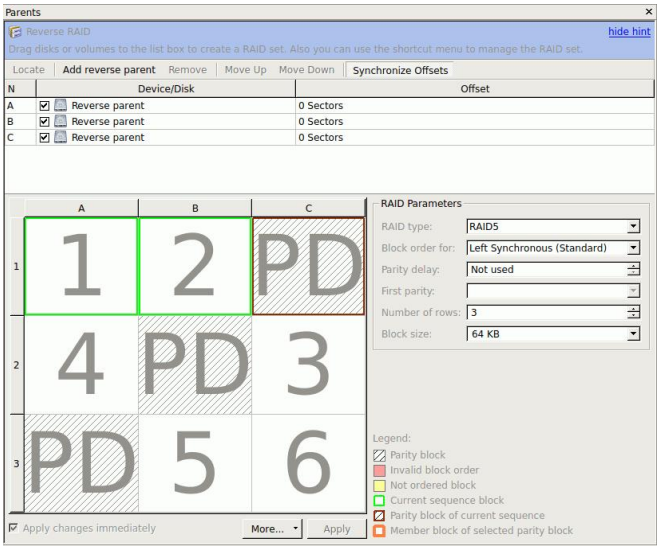
1 Right-click the disk object on the Drives **panel and select Create Reverse RAID on the context menu.**



> The Reverse parents will appear on the Drives panel

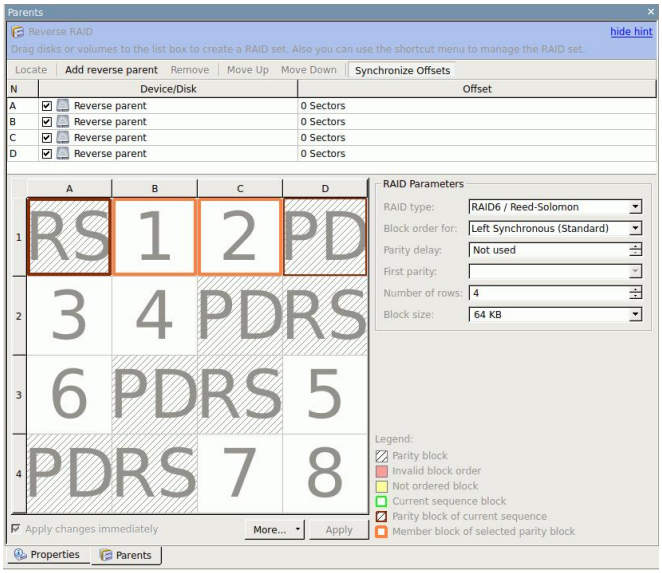


Initially, the reverse RAID is set to its default values as RAID 5 on the Parents tab.



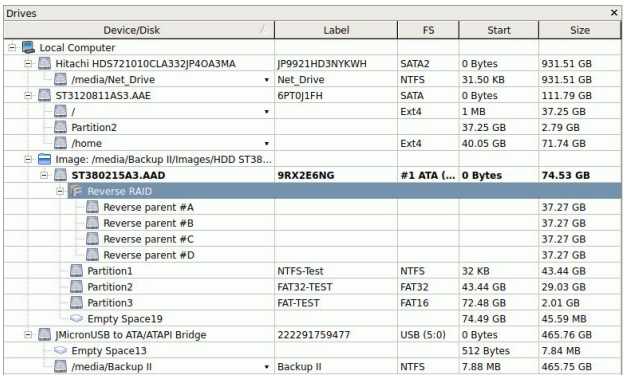
2 Adjust RAID parameters on the Parents **tab, as necessary.**

You need to add one reverse parent, change RAID type, and adjust RAID offset .



> Process the appeared reverse parents on the Drives panel as real objects.

These parents can be imaged, viewed/edited, etc.



2.4.13.2 Reverse RAID of a RAID

This technique can be used to re-construct data on individual RAID disks when data on physical disks is corrupted, but can be recovered using RAID redundancy.

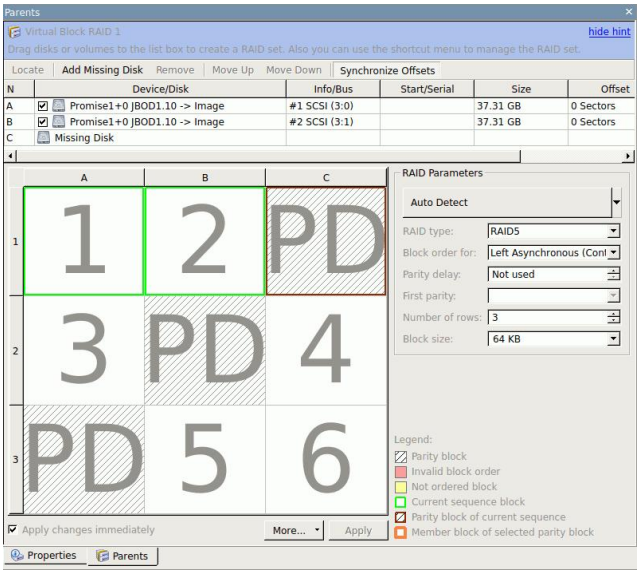
Suppose you have a RAID 5 with one missing hard drive and you need to reconstruct data on that disk. You can do that by creating a reverse RAID for it and then copy data from that missing disk to a real one, or to an image.

Note: Many controllers write their own metadata to disks to recognize that the disks belong to certains RAIDs. Without that metadata they won't see those RAIDs. You have to write that metadata manually.

To create a reverse RAID of a RAID with a missing disk,

1 **Create a virtual RAID 5 of the existing hard drives or their images**

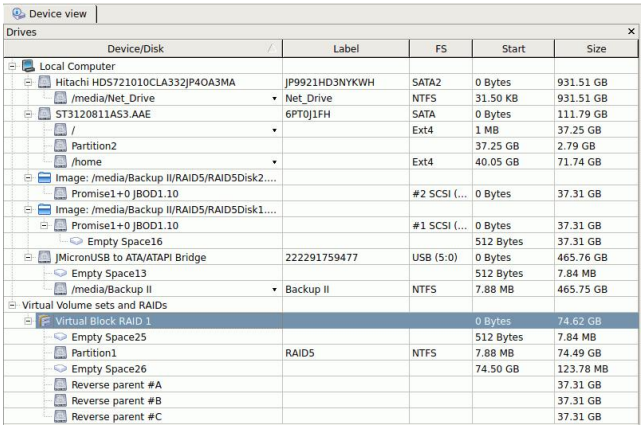
Add a missing disk to the Parents tab.



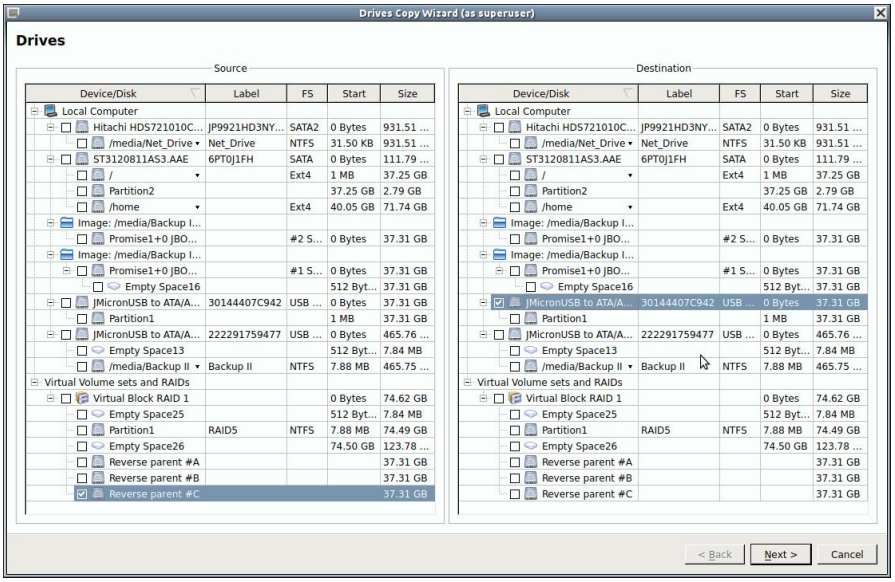
If necessary, read the Basic RAID 4 and RAID 5 Operations and Volumes Sets and RAIDs help pages for details.

2 **Right-click the Virtual Block Raid on the** Drives **panel and select Create Reverse RAID on the context menu.**

> **The Reverse parents will appear on the Drives panel**



These parents may be processed as real objects, they can be imaged, viewed/edited. For your case the missing disk can be copied to a hard drive in the Drive Copy Wizard.



Note: The reverse parents contain the data that should be on the RAID parents, according to its layout, while RAID parents contain actual data, that may be corrupted.

2.5 Data Recovery over Network

This chapter explains how to perform data recovery operations over network.

R-Studio has network capabilities that allow the system administrator, using its computer, to recover files on any computers accessible over network.

R-Studio supports the TCP/IP protocol and any protocol supported in Microsoft Network.

R-Studio Agent must be installed on computers where files are to be recovered. This program gives **R-Studio** access to local disks on remote computers over network.

If, due to file system crash, the network computer where you are going to recover your data cannot start, you may use **R-Studio Agent Emergency** to start the computer.

Files can be recovered without ***R-Studio Agent*** if the computer where the files are to be recovered runs Windows NT/2000/XP/2003/Vista/2008/7 is accessible from a computer also running Windows NT/2000/XP/2003/Vista/2008/7. In this case, the administrator must have administrator privileges on the remote computer.

You should always disable a firewall and/or antivirus software on the both computers. As an alternative, advanced users may tune them to allow **R-Studio** and ***R-Studio Agent*** to communicate via network.

All data transmitted over network are encrypted with a strong algorithm for data security. Restoring data over network is very much the same as that on a local computer.

In addition, **R-Studio** can load/save any files like disk images, scan info files, RAID configuration files, from/to the computers to which it has access using ***R-Studio Agent***.

- **R-Studio Agent**
- **Data Recovery over Network**
- **Connecting over the Internet**

2.5.1 R-Studio Agent

R-Studio Agent is a program that provides **R-Studio** with an access to the drives of a network computer. It should be installed and properly registered on the computer which drives are to be accessed. ***R-Studio Agent*** has versions for the following PC operating systems:

- **Linux**
- **Windows**
- **Mac OS**

and there is **R-Studio Agent Emergency** that can be used to start a computer from which you are going to recover data that cannot start other way due to a file system crash, for example. **R-Studio** can work equally with all versions of ***R-Studio Agent*** and access computers run under Windows, Mac OS, and Linux.

You must have enough rights on the remote computer to install and run ***R-Studio Agent***.

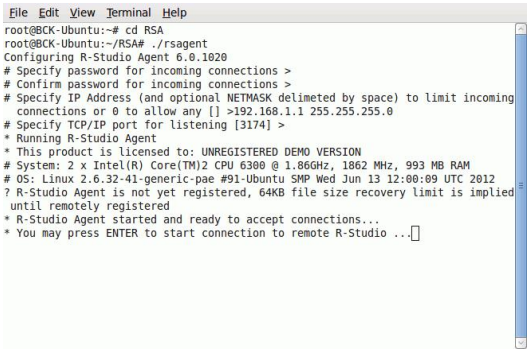
2.5.1.1 R-Studio Agent for Linux

You need to have the root privileges to run **R-Studio Agent for Linux.**

Unlike **R-Studio Agent for Windows** and **R-Studio Agent for Mac**, **R-Studio Agent for Linux** is a console application and should be run in the Terminal. You also need to mark it as an executable before start.

When it is started for the first time, **R-Studio Agent for Linux** asks for its configuration.

R-Studio Agent for Linux Configuration **dialog box**


File Edit View Terminal Help
root@BCK-Ubuntu:~# cd RSA
root@BCK-Ubuntu:~/RSA# ./rsagent
Configuring R-Studio Agent 6.0.1020
Specify password for incoming connections >
Confirm password for incoming connections >
Specify IP Address (and optional NETMASK delimeted by space) to limit incoming
connections or 0 to allow any [] >192.168.1.1 255.255.255.0
Specify TCP/IP port for listening [3174] >
* Running R-Studio Agent
* This product is licensed to: UNREGISTERED DEMO VERSION
# System: 2 x Intel(R) Core(TM)2 CPU 6300 @ 1.86GHz, 1862 MHz, 993 MB RAM
# OS: Linux 2.6.32-41-generic-pae #91-Ubuntu SMP Wed Jun 13 12:00:09 UTC 2012
? R-Studio Agent is not yet registered, 64KB file size recovery limit is implied
until remotely registered
* R-Studio Agent started and ready to accept connections...
* You may press ENTER to start connection to remote R-Studio ...

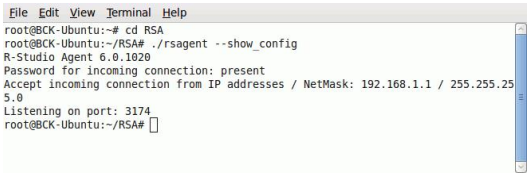
R-Studio Agent for Linux Options

Specify password for incoming connection	Enter a password to obtain access to this computer from a network.
Confirm password for incoming connection	Re-enter the password for confirmation.
Specify IP address...	Specifies addresses and a subnet mask from which this computer can be accessed. Enter 0 to allow connections from any address.
Specify TCP/IP Port for listening	A TCP/IP port for incoming connections. Press Enter for the default one [3174].

Don't pay much attention to the warning about "unregistered demo version". If necessary, you'll be able to register **R-Studio Agent for Linux** through **R-Studio**.

You may see the current configuration by starting **R-Studio Agent for Linux** with the command `rsagent --show_config`.

R-Studio Agent for Linux Configuration **dialog box**


File Edit View Terminal Help
root@BCK-Ubuntu:~# cd RSA
root@BCK-Ubuntu:~/RSA# ./rsagent --show_config
R-Studio Agent 6.0.1020
Password for incoming connection: present
Accept incoming connection from IP addresses / NetMask: 192.168.1.1 / 255.255.25
5.0
Listening on port: 3174
root@BCK-Ubuntu:~/RSA#

You may change the current configuration by starting **R-Studio Agent for Linux** with the command `rsagent --configure`.

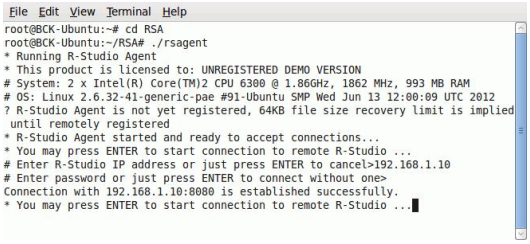
Connecting from R-Studio Agent for Linux to R-Studio.

To establish a connection from R-Studio Agent for Linux to R-Studio,

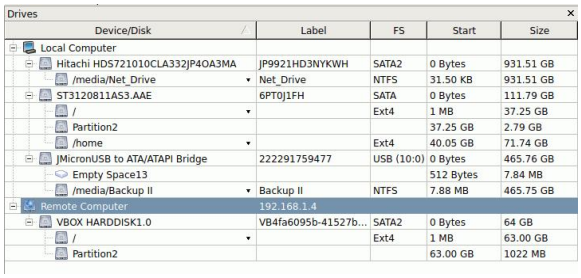
1 **Run the R-Studio Agent for Linux and press Enter**

2 **Enter the necessary information**

Connect to R-Studio **dialog box**


File Edit View Terminal Help
root@BCK-Ubuntu:~# cd RSA
root@BCK-Ubuntu:~/RSA# ./rsagent
* Running R-Studio Agent
* This product is licensed to: UNREGISTERED DEMO VERSION
# System: 2 x Intel(R) Core(TM)2 CPU 6300 @ 1.86GHz, 1862 MHz, 993 MB RAM
# OS: Linux 2.6.32-41-generic-pae #91-Ubuntu SMP Wed Jun 13 12:00:09 UTC 2012
? R-Studio Agent is not yet registered, 64KB file size recovery limit is implied
until remotely registered
* R-Studio Agent started and ready to accept connections...
* You may press ENTER to start connection to remote R-Studio ...
# Enter R-Studio IP address or just press ENTER to cancel>192.168.1.10
# Enter password or just press ENTER to connect without one>
Connection with 192.168.1.10:8080 is established successfully.
* You may press ENTER to start connection to remote R-Studio ...

> **R-Studio Agent for Linux will connect to the computer where R-Studio is running and it will show the hard drive and logical disk structure of the remote computer.**


Drives
Device/Disk
Label
FS
Start
Size
Local Computer
Hitachi HDS721010CLA332JP4OA3MA JP9921HD3NYKWH SATA2 0 Bytes 931.51 GB
/media/Net_Drive Net_Drive NTFS 31.50 KB 931.51 GB
ST3120811AS3.AAE 6PT0J1FH SATA 0 Bytes 111.79 GB
/ Ext4 1 MB 37.25 GB
Partition2 37.25 GB 2.79 GB
/home Ext4 40.05 GB 71.74 GB
JMicronUSB to ATA/ATAPI Bridge 222291759477 USB (10:0) 0 Bytes 465.76 GB
Empty Space13 512 Bytes 7.84 MB
/media/Backup II Backup II NTFS 7.88 MB 465.75 GB
Remote Computer 192.168.1.4
VBOX HARDDISK1.0 VB4fa6095b-41527b... SATA2 0 Bytes 64 GB
/ Ext4 1 MB 63.00 GB
Partition2 63.00 GB 1022 MB

It can be processed the same way as that on a local computer.

2.5.1.2 R-Studio Agent for Windows

Attention Windows NT/2000/XP/2003/Vista/2008/7 users: R-Studio Agent should be installed under an administrator account.

When installed, ***R-Studio Agent*** starts automatically and runs as a service. To configure it, ***R-Studio Agent*** should be started again manually.

The following switches are available:

`-?`	evokes a help screen;
`-install`	installs ***R-Studio Agent*** as a service
`-remove`	removes ***R-Studio Agent*** services
`-console`	starts ***R-Studio Agent*** as a console application

Started without a switch, ***R-Studio Agent*** runs as a GUI application and its icon appears on the taskbar tray. In this mode, it can be configured and its log may be viewed.

Simply connect to the remote computer providing a desired password for ***R-Studio Agent*** in the Connect to Remote Computer dialog box. **R-Studio** checks if there is ***R-Studio Agent*** running on this computer. If not, a Can't connect... message will appear.

Click the **Yes** button, and **R-Studio** will remotely install ***R-Studio Agent***.

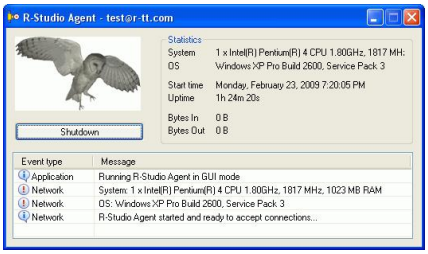
Attention Windows NT/2000/XP/2003/Vista/2008/7 users: R-Studio Agent may be remotely installed over a network from a computer running Windows NT/2000/XP/2003/Vista/2008/7 to another computer running Windows NT/2000/XP/2003/Vista/2008/7. To do so, you must have administrator accounts on both computers.

To access the R-Studio Agent main panel,

1 **Click its tray icon**

> **The main panel will appear. You may view its log**

R-Studio Agent main panel

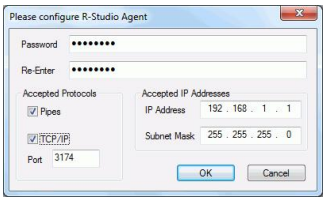

R-Studio Agent - test@r-tt.com
Statistics
System 1 x Intel(R) Pentium(R) 4 CPU 1.80GHz, 1817 MH:
OS Windows XP Pro Build 2600, Service Pack 3
Start time Monday, February 23, 2009 7:20:05 PM
Uptime 1h 24m 20s
Bytes In 0 B
Bytes Out 0 B
Shutdown
Event type
Message
Application Running R-Studio Agent in GUI mode
Network System: 1 x Intel(R) Pentium(R) 4 CPU 1.80GHz, 1817 MHz, 1023 MB RAM
Network OS: Windows XP Pro Build 2600, Service Pack 3
Network R-Studio Agent started and ready to accept connections...

To configure *R-Studio Agent*,

1 **Right-click its tray icon and select Configure**

2 **Specify required parameters on the** Please configure R-Studio Agent **dialog box and click the OK button**

Please configure R-Studio Agent **dialog box**



R-Studio Agent Options

Password:	Enter a password to obtain access to this computer from a network.
Re-Enter:	Re-enter the password.
Accepted Protocols	
Pipes	supported by Windows NT/2000/XP/2003/Vista/2008/7 only. To improve security, this option should be disabled.
TCP/IP	supported by any network OS.
Port	port for incoming connections
Accepted IP Addresses	
IP Address	specifies addresses from which this computer can be accessed.
Subnet Mask	specifies a subnet mask of the network from which this computer can be accessed.

> ***R-Studio Agent*** **will now run with the specified parameters**

2.5.1.3 R-Studio Agent for Mac

You need to have an administrative account on the Mac computer to start **R-Studio Agent for Mac.**

To start the R-Studio Agent for Mac and access its main panel,

1 **Go to the Application folder, double-click R-Studio Agent for Mac, and enter the account password**

> **The main panel will appear. You may view its log**

R-Studio Agent for Mac main panel

R-Studio Agent Technician
IP Address: 192.168.1.6
Start time 07/15/12 20:39:59
Uptime 0h 2m 54s
Bytes In 4524 B
Bytes Out 171 KB
Message
Event type
Network System: 2 x Intel(R) Core(TM)2 CPU 6300 @ 1.86...
Network OS: Mac OS X 10.4.5
Network R-Studio Agent Technician started and ready to accep...
Network Request from 192.168.1.10.
Network Connection with 192.168.1.10 is established successf...

To configure *R-Studio Agent for Mac*,

1 **Go to the R-Studio Agent for Mac menu and select Preferences**

2 **Specify required parameters on the** Please configure R-Studio Agent **dialog box and click the OK button**

Please configure R-Studio Agent Mac **dialog box**

R-Studio Agent for Mac Options

Password:	Enter a password to obtain access to this computer from a network.
Re-Enter:	Re-enter the password.
Incoming connection preferences	
Enable incoming connections	Select this checkbox if you want to allow incoming connections.
TCP/IP Port	A TCP/IP port for incoming connections
Accepted IP Addresses	
IP Address	specifies addresses from which this computer can be accessed.
Subnet Mask	specifies a subnet mask of the network from which this computer can be accessed.

> ***R-Studio Agent for Mac*** **will now run with the specified parameters**

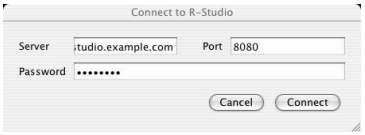
Connecting from R-Studio Agent for Mac to R-Studio.

To establish a connection from R-Studio Agent for Mac to R-Studio,

1 **Run the R-Studio Agent for Mac and select Connect from the Tools menu**

2 **Enter the necessary information on the** Connect to R-Studio **dialog box and click the Connect button.**

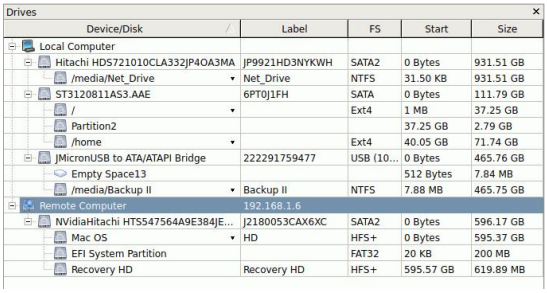
Connect to R-Studio **dialog box**



Connect to R-Studio settings

Server	Specify the DNS name or IP address of the host where **R-Studio** is running.
Port	Specify the port set on the **R-Studio** Connect to Remote Computer dialog box.
Password	Specify the password set on the **R-Studio** Connect to Remote Computer dialog box.

> **R-Studio Agent for Mac will connect to the computer where R-Studio is running and it will show the hard drive and logical disk structure of the remote computer.**


Drives
Device/Disk
Label
FS
Start
Size
Local Computer
Hitachi HDS721010CLA332JP4OA3MA JP9921HD3NYKWH SATA2 0 Bytes 931.51 GB
/media/Net_Drive Net_Drive NTFS 31.50 KB 931.51 GB
ST3120811AS3.AAE 6PT0J1FH SATA 0 Bytes 111.79 GB
/ Ext4 1 MB 37.25 GB
Partition2 37.25 GB 2.79 GB
/home Ext4 40.05 GB 71.74 GB
JMicronUSB to ATA/ATAPI Bridge 222291759477 USB (10... 0 Bytes 465.76 GB
Empty Space13 512 Bytes 7.84 MB
/media/Backup II Backup II NTFS 7.88 MB 465.75 GB
Remote Computer 192.168.1.6
NVidiaHitachi HTS547564A9E384JE... J2180053CAX6XC SATA2 0 Bytes 596.17 GB
Mac OS HD HFS+ 0 Bytes 595.37 GB
EFI System Partition FAT32 20 KB 200 MB
Recovery HD Recovery HD HFS+ 595.57 GB 619.89 MB

It can be processed the same way as that on a local computer.

2.5.2 Data Recovery over Network

Generally, data restoring over network is very much the same as that on a local computer.

R-Studio Agent should be running on the network computer where data are to be recovered.

Read the **Connecting over the Internet** topic to learn how to establish connection between **R-Studio** and **R-Studio Agent** over the Internet.

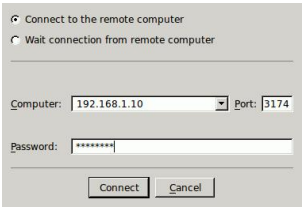
To connect to a remote computer

1 **Click the Connect to Remote button, or**

Select **Connect To Remote** on the **Drive** menu

2 Specify the name or IP address of the remote computer where data are to be recovered in the Computer**: field**

Connect to Remote Computer **dialog box**

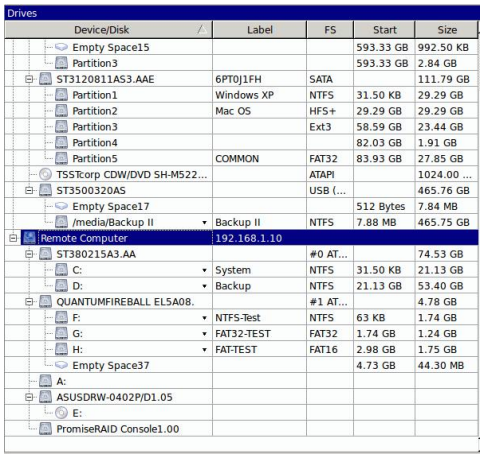


The Port should coincide with the port specified for the **R-Studio Agent**.

The Password: field is for the password of ***R-Studio Agent*** running on the remote computer.

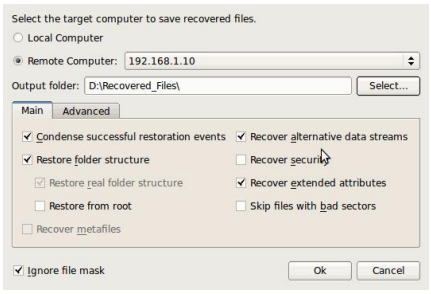
Note: If the remote computer is started with **R-Studio Agent Emergency**, leave this field blank.

> R-Studio will connect to the remote computer and show its hard drive and logical disk structure of the remote computer below the device/disk structure of your local computer


Drives
Device/Disk
Label
FS
Start
Size
Empty Space15 593.33 GB 992.50 KB
Partition3 593.33 GB 2.84 GB
ST3120811AS3.AAE 6PT0J1FH SATA 111.79 GB
Partition1 Windows XP NTFS 31.50 KB 29.29 GB
Partition2 Mac OS HFS+ 29.29 GB 29.29 GB
Partition3 Ext3 58.59 GB 23.44 GB
Partition4 82.03 GB 1.91 GB
Partition5 COMMON FAT32 83.93 GB 27.85 GB
TSSTcorp CDW/DVD SH-M522... ATAPI 1024.00 ...
ST3500320AS USB (... 465.76 GB
Empty Space17 512 Bytes 7.84 MB
/media/Backup II Backup II NTFS 7.88 MB 465.75 GB
Remote Computer 192.168.1.10
ST380215A3.AA #0 AT... 74.53 GB
C: System NTFS 31.50 KB 21.13 GB
D: Backup NTFS 21.13 GB 53.40 GB
QUANTUMFIREBALL EL5A08. #1 AT... 4.78 GB
F: NTFS-Test NTFS 63 KB 1.74 GB
G: FAT32-TEST FAT32 1.74 GB 1.24 GB
H: FAT-TEST FAT16 2.98 GB 1.75 GB
Empty Space37 4.73 GB 44.30 MB
A:
ASUSDRW-0402P/D1.05
E:
PromiseRAID Console1.00

It can be processed the same way as that on a local computer.

Recover **dialog box**



When the Recover dialog box appears, you may select whether you want to save recovered files on the local or remote computer. Saving recovered files on a remote computer may be useful when the remote computer has a healthy disk because you do not have to transfer files over network. It may be an external USB hard drive, for example.

When **R-Studio** connects to the remote computer, it check if ***R-Studio Agent*** is present and its password. If there is no ***R-Studio Agent*** installed, **R-Studio** may try to remotely install it. See the **R-Studio Agent** topic for details.

2.5.3 Connecting over the Internet

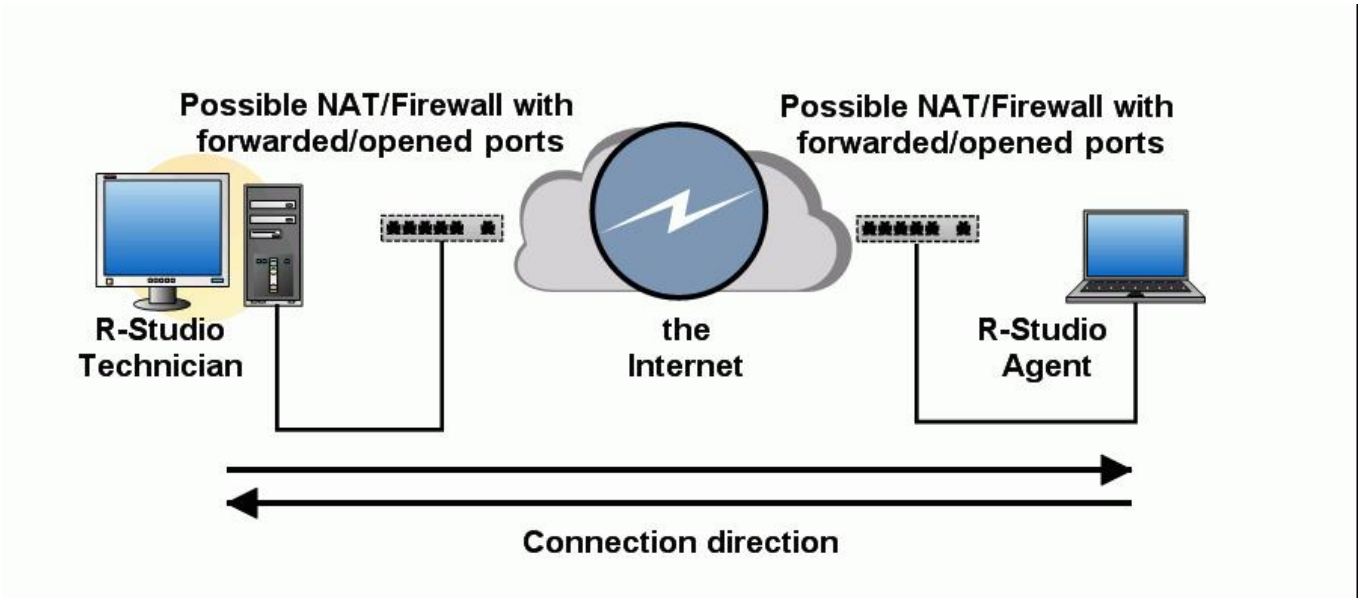
R-Studio and **R-Studio Agent** can be connected over the Internet. The connection can be made either using IP addresses or DNS names.

If hosts where **R-Studio** and **R-Studio Agent** are running have public IP addresses the connection can be made the same way as for the local network, except that the IP address or DNS name should be explicitly specified in the Computer filed the Connect to Remote Computer dialog box

If either (or both) of the hosts are on private networks behind NATs and firewalls and do not have public IP addresses, the corresponding ports should be opened or forwarded. In addition, connection should be made either only from **R-Studio** or from **R-Studio Agent**.

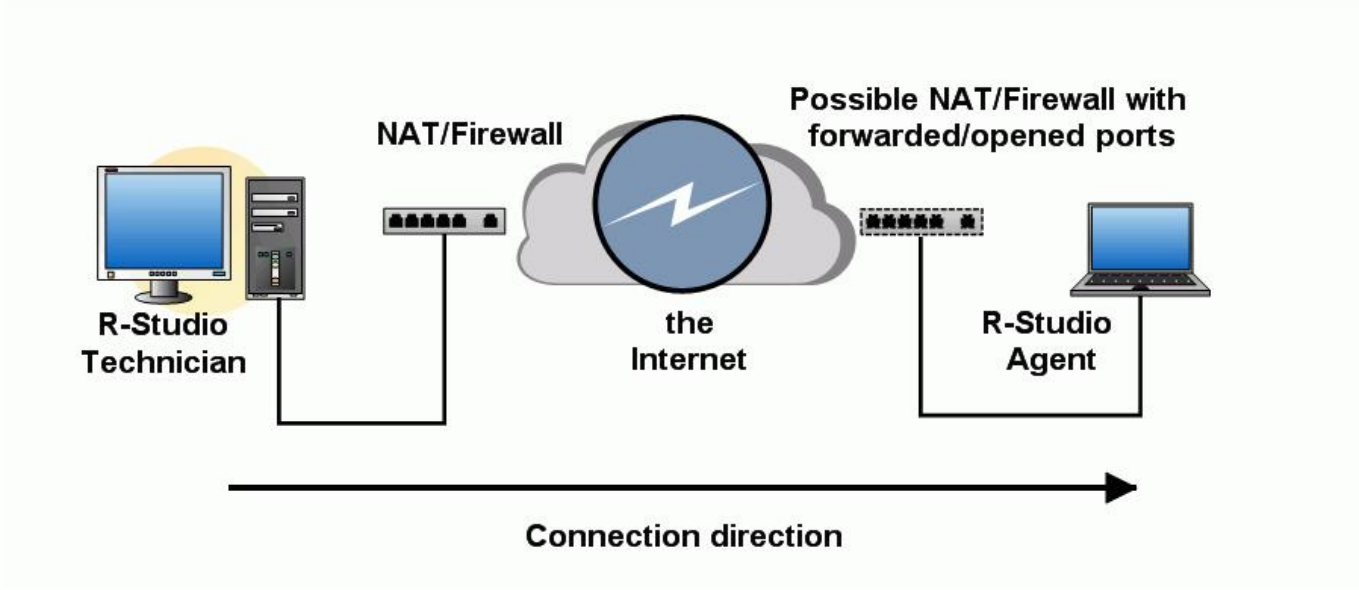
Connection directions

*** Both R-Studio and R-Studio Agent have public IP addresses (no NAT/firewall) or the ports on the NAT/ firewall are forwarded/opened.**



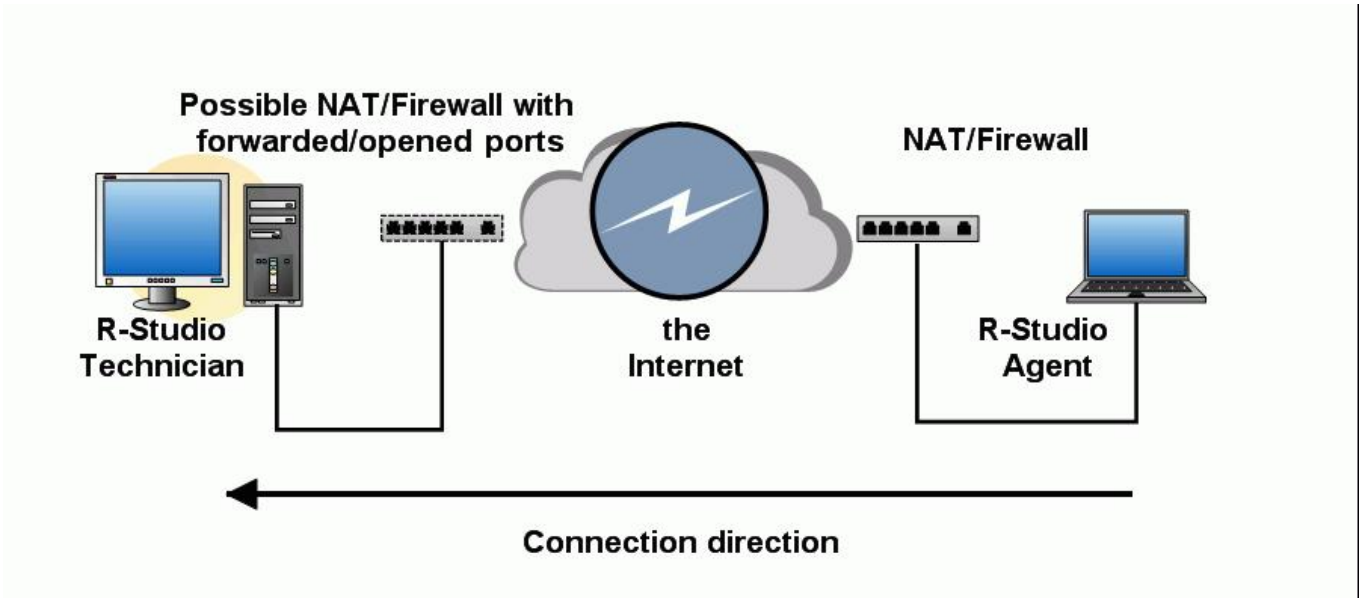
A connection can be made either from **R-Studio** or from **R-Studio Agent**.

* **R-Studio is behind a NAT and R-Studio Agent has a public IP address or the ports on its NAT/firewall are forwarded/opened.**



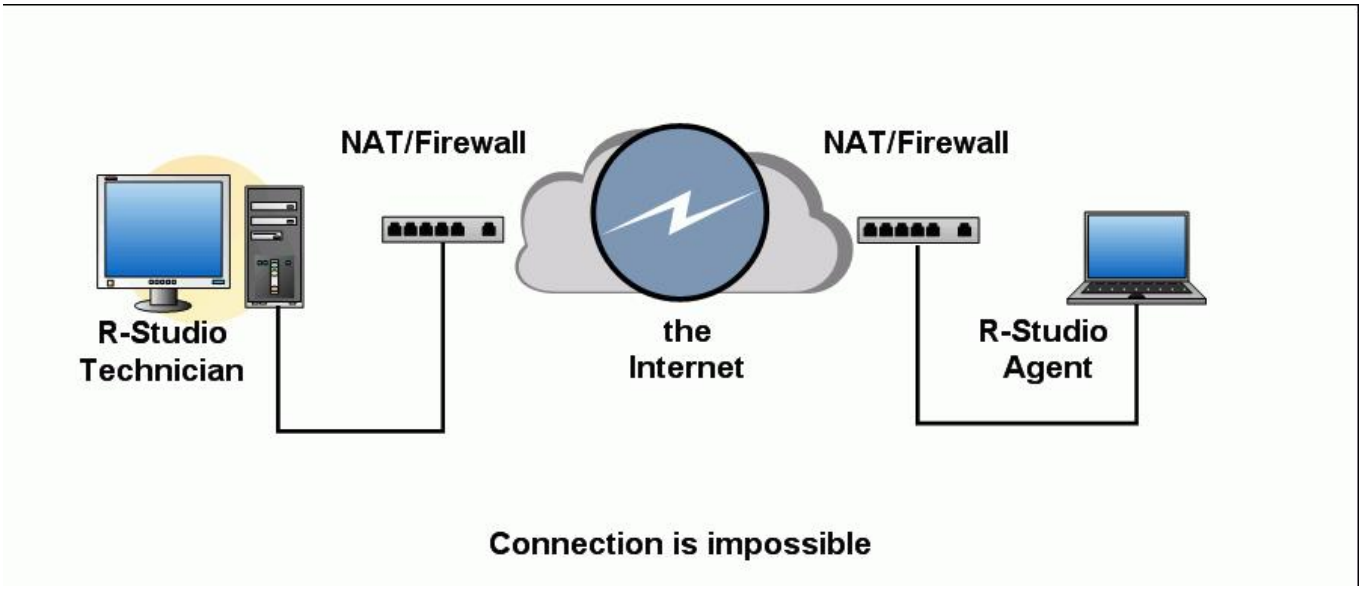
A connection should be made from **R-Studio**.

* **R-Studio has a public IP address or the ports on its NAT/firewall are forwarded/opened and R-Studio Agent is behind a NAT.**



A connection should be made from **R-Studio Agent**.

*** Both R-Studio and R-Studio Agent are behind NATs/firewalls.**



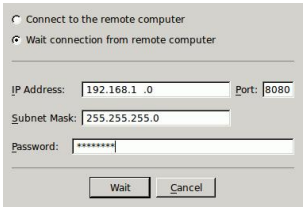
No connections are possible.

Connection from R-Studio Agent to R-Studio

R-Studio settings

If a connection is to be made from **R-Studio Agent** to **R-Studio**, **R-Studio** should be set to accept connection on the Connect to Remote Computer dialog box.

Connect to Remote Computer **dialog box**



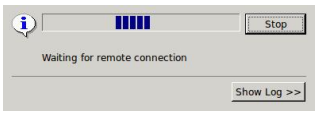
Select **Wait connection from remote computer**, and specify options for incoming connections.

R-Studio Incoming Connection Options

Password:	Enter a password to obtain access to this computer from a network.
IP Address	specifies addresses from which this computer can be accessed.
Subnet Mask	specifies subnet mask of the network from which this computer can be accessed.
Port	port for incoming connections.

R-Studio will wait for an incoming connection.

Waiting for remote connection **dialog box**



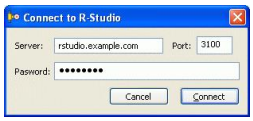
Connecting from R-Studio Agent to R-Studio.

To establish a connection from R-Studio Agent to R-Studio,

1 **Right-click the R-Studio Agent tray icon and select Connect**

2 **Enter the necessary information on the** Connect to R-Studio **dialog box and click the Connect button.**

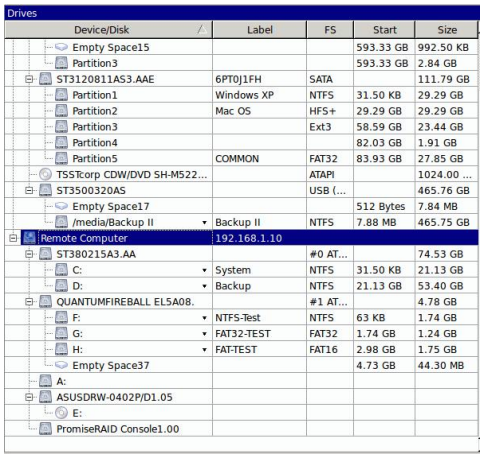
Connect to R-Studio **dialog box**



Connect to R-Studio settings

Server	Specify the DNS name or IP address of the host where **R-Studio** is running.
Port	Specify the port set on the **R-Studio** Settings (Server) dialog box.
Password	Specify the password set on the **R-Studio** Settings (Server) dialog box.

> **R-Studio Agent will connect to the computer where R-Studio is running and it will show the hard drive and logical disk structure of the remote computer.**


Drives
Device/Disk
Label
FS
Start
Size
Empty Space15 593.33 GB 992.50 KB
Partition3 593.33 GB 2.84 GB
ST3120811AS3.AAE 6PT0J1FH SATA 111.79 GB
Partition1 Windows XP NTFS 31.50 KB 29.29 GB
Partition2 Mac OS HFS+ 29.29 GB 29.29 GB
Partition3 Ext3 58.59 GB 23.44 GB
Partition4 82.03 GB 1.91 GB
Partition5 COMMON FAT32 83.93 GB 27.85 GB
TSSTcorp CDW/DVD SH-M522... ATAPI 1024.00 ...
ST3500320AS USB (... 465.76 GB
Empty Space17 512 Bytes 7.84 MB
/media/Backup II Backup II NTFS 7.88 MB 465.75 GB
Remote Computer 192.168.1.10
ST380215A3.AA #0 AT... 74.53 GB
C: System NTFS 31.50 KB 21.13 GB
D: Backup NTFS 21.13 GB 53.40 GB
QUANTUMFIREBALL EL5A08. #1 AT... 4.78 GB
F: NTFS-Test NTFS 63 KB 1.74 GB
G: FAT32-TEST FAT32 1.74 GB 1.24 GB
H: FAT-TEST FAT16 2.98 GB 1.75 GB
Empty Space37 4.73 GB 44.30 MB
A:
ASUSDRW-0402P/D1.05
E:
PromiseRAID Console1.00

It can be processed the same way as that on a local computer.

III Text/hexadecimal Editor

Any object visible to **R-Studio** can be viewed and edited in the **Text/hexadecimal editor**. It is also able to parse the data and represent data according to various data patterns. You may also create your own patterns to parse data.

You may turn numerical indexes for objects to distinguish them better.

- **Viewing and Editing Objects**
- **Creating Custom Patterns**
- **Pattern Example I**
- **Pattern Example II**

R-Studio Features
Contact Information and Technical Support
Data Recovery Using R-Studio
Basic File Recovery
Advanced Data Recovery
Mass File Recovery
Volume Sets and RAIDs
Data Recovery over Network
Technical Information and Troubleshooting
R-Studio Emergency
R-Studio Agent Emergency

3.1 Viewing and Editing Objects

YOU MUST BE ABSOLUTELY SURE OF WHAT AND WHERE YOU ARE WRITING!
Or you may completely lose all your data.

Before you can physically write anything on a disk, you need to enable writing.

To enable writing,

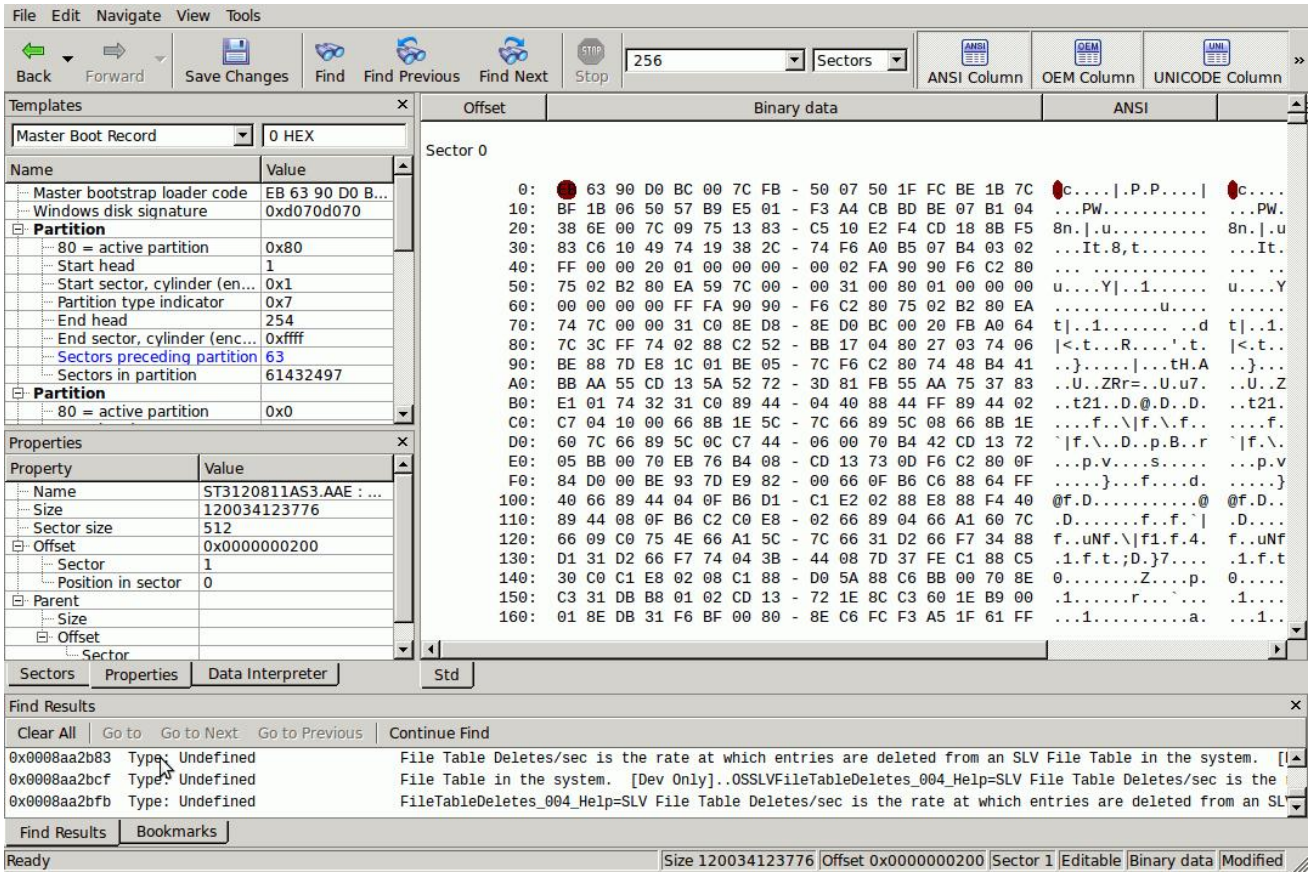
1 **On the R-Studio main panel, select the Tools menu, then Settings, and select Enable Write on the Settings dialog box.**

> **The** Editable: **status will change to** Yes **from** Read Only**.**
Now the object can be edited.

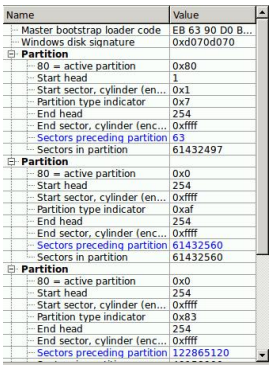
To view/edit an object,

1 **Right-click the object and select View/Edit on the context menu**, or
Select the object and select **View/Edit** on the **File** menu

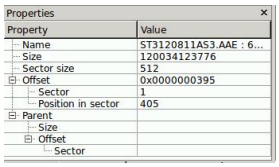
R-Studio Text/hexadecimal editor


File Edit Navigate View Tools
Back
Forward
Save Changes
Find
Find Previous
Find Next
Stop
256
Sectors
ANSI Column
OEM Column
UNICODE Column
Templates
Master Boot Record
0 HEX
Name
Value
Master bootstrap loader code
EB 63 90 D0 B...
Windows disk signature
0xd070d070
Partition
80 = active partition
0x80
Start head
1
Start sector, cylinder (en...
0x1
Partition type indicator
0x7
End head
254
End sector, cylinder (enc...
0xffff
Sectors preceding partition
63
Sectors in partition
61432497
Partition
80 = active partition
0x0
Properties
Property
Value
Name
ST3120811AS3.AAE : ...
Size
120034123776
Sector size
512
Offset
0x0000000200
Sector
1
Position in sector
0
Parent
Size
Offset
Sector
Sectors
Properties
Data Interpreter
Offset
Binary data
ANSI
Sector 0
0: 63 90 D0 BC 00 7C FB - 50 07 50 1F FC BE 1B 7C
10: BF 1B 06 50 57 B9 E5 01 - F3 A4 CB BD BE 07 B1 04
20: 38 6E 00 7C 09 75 13 83 - C5 10 E2 F4 CD 18 8B F5
30: 83 C6 10 49 74 19 38 2C - 74 F6 A0 B5 07 B4 03 02
40: FF 00 00 20 01 00 00 00 - 00 02 FA 90 90 F6 C2 80
50: 75 02 B2 80 EA 59 7C 00 - 00 31 00 80 01 00 00 00
60: 00 00 00 00 FF FA 90 90 - F6 C2 80 75 02 B2 80 EA
70: 74 7C 00 00 31 C0 8E D8 - 8E D0 BC 00 20 FB A0 64
80: 7C 3C FF 74 02 88 C2 52 - BB 17 04 80 27 03 74 06
90: BE 88 7D E8 1C 01 BE 05 - 7C F6 C2 80 74 48 B4 41
A0: BB AA 55 CD 13 5A 52 72 - 3D 81 FB 55 AA 75 37 83
B0: E1 01 74 32 31 C0 89 44 - 04 40 88 44 FF 89 44 02
C0: C7 04 10 00 66 8B 1E 5C - 7C 66 89 5C 08 66 8B 1E
D0: 60 7C 66 89 5C 0C C7 44 - 06 00 70 B4 42 CD 13 72
E0: 05 BB 00 70 EB 76 B4 08 - CD 13 73 0D F6 C2 80 0F
F0: 84 D0 00 BE 93 7D E9 82 - 00 66 0F B6 C6 88 64 FF
100: 40 66 89 44 04 0F B6 D1 - C1 E2 02 88 E8 88 F4 40
110: 89 44 08 0F B6 C2 C0 E8 - 02 66 89 04 66 A1 60 7C
120: 66 09 C0 75 4E 66 A1 5C - 7C 66 31 D2 66 F7 34 88
130: D1 31 D2 66 F7 74 04 3B - 44 08 7D 37 FE C1 88 C5
140: 30 C0 C1 E8 02 08 C1 88 - D0 5A 88 C6 BB 00 70 8E
150: C3 31 DB B8 01 02 CD 13 - 72 1E 8C C3 60 1E B9 00
160: 01 8E DB 31 F6 BF 00 80 - 8E C6 FC F3 A5 1F 61 FF
Std
Find Results
Clear All
Go to
Go to Next
Go to Previous
Continue Find
0x0008aa2b83 Type: Undefined File Table Deletes/sec is the rate at which entries are deleted from an SLV File Table in the system. [
0x0008aa2bcf Type: Undefined File Table in the system. [Dev Only]..OSSLVFileTableDeletes_004_Help=SLV File Table Deletes/sec is the
0x0008aa2bfb Type: Undefined FileTableDeletes_004_Help=SLV File Table Deletes/sec is the rate at which entries are deleted from an SL
Find Results
Bookmarks
Ready
Size 120034123776
Offset 0x0000000200
Sector 1
Editable
Binary data
Modified

Data Parsed According to the Selected Pattern

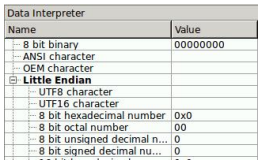


Object Properties

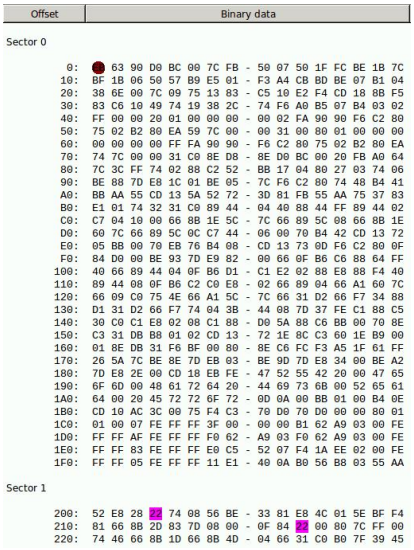


Object Sector Mapping

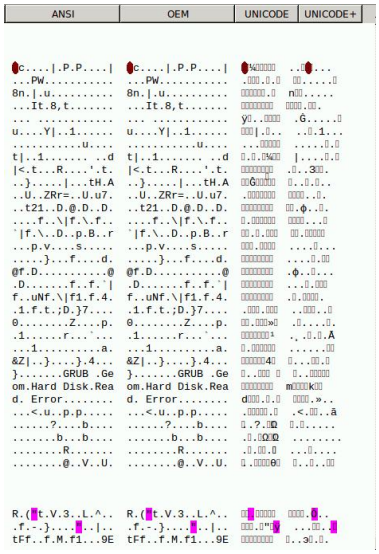
Data Shown as Various Digits



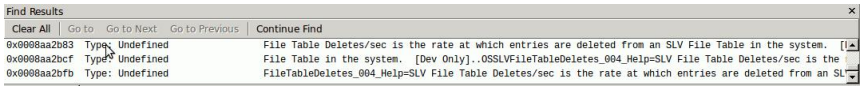
Binary view



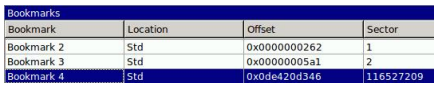
Text view



Find Results


Find Results
Clear All
Go to
Go to Next
Go to Previous
Continue Find
0x0008aa2b83 Type: Undefined File Table Deletes/sec is the rate at which entries are deleted from an SLV File Table in the system. [
0x0008aa2bcf Type: Undefined File Table in the system. [Dev Only]..OSSLVFileTableDeletes_004_Help=SLV File Table Deletes/sec is the
0x0008aa2bfb Type: Undefined FileTableDeletes_004_Help=SLV File Table Deletes/sec is the rate at which entries are deleted from an SL

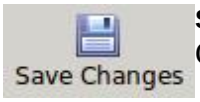
List of Bookmarks



Viewer / Editor status

Previous Pattern
Click this button to go to the previous pattern.

Next Pattern
Click this button to go to the next pattern.



Save Changes
Click this button to save changes.

Code pages
Turns supported code pages on/off.

Autoflow
Click this button to turn autoflow on.

Panel view options

You may set which panels and bars to enable/disable.

To enable/disable:

ANSI data	Select/clear **ANSI** on the **View** menu
OEM data	Select/clear **OEMr** on the **View** menu
UNICODE data	Select/clear **UNICODE** on the **View** menu
UNICODE+ data	Select/clear **UNICODE+** on the **View** menu
Toolbar	Select/clear **Toolbar** on the **View** menu
Properties View	Select/clear **Properties View** on the **View** menu
Sectors View	Select/clear **Sectors View** on the **View** menu
Data Interpreter View	Select/clear **Data Interpreter View** on the **View** menu
Template View	Select/clear **Template View** on the **View** menu
Bookmarks View	Select/clear **Bookmarks View** on the **View** menu
Find Results View	Select/clear **Find Results View** on the **View** menu

2 View the information and make necessary changes

Select **Save Changes** on the **Tools** menu if you want to save changes.

Other ways to save changes

- Select **Save Changes** on the **File** menu

or

- Press the **Ctrl+S** keys

Viewing

There are up to four tabs showing the data in different representations. Actual number of tabs depends on the object and property being viewed/edited.

Std	Exact attribute data. If the attribute is compressed, **R-Studio** decompresses it prior to showing.
Unlimited	Exact attribute data + free space of last cluster. If the attribute is compressed, **R-Studio** decompresses it prior to showing.

Direct	Actual data written on the disk. If the attribute is not compressed, it coincides with the Std representation.
Allocation	Resident part of the attribute.

You may view data in 4 various code pages: ANSI/OEM/UNICODE/UNICODE+ by switching on/off the respective code pages in the **Code pages** buttons or select the appropriate code pages on the **View** menu.

Patterns or Templates

You may select a pattern according to which the data will be parsed and shown in the parsed data pane. The Data Interpreter shows the data selected on the Template pane in various representations.

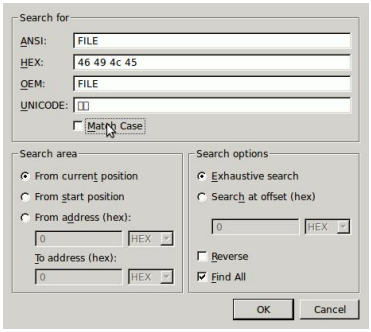
You may find the next or previous data that matches the pattern signature on the disk. Right-click the right pane of the editor and select either **Find Template Signature Next** or **Find Template Signature Previous** on the context menu. You may also select these items on the **Edit** menu.

You may also create your own patterns to parse data from various objects.

Searching

To search for a particular string, click the **Find**, **Find Next**, or **Find Previous** buttons or the same items on the **Edit** menu, and specify the string on the Search dialog box.

Search **dialog box**



Search options

Search for	
HEX	Field for the string to search for in the hexadecimal representation
ANSI	Field for the string to search for in the ANSI encoding
OEM	Field for the string to search for in the OEM encoding
UNICODE	Field for the string to search for in the UNICODE encoding
Match case	Select this check box to make the search case-sensitive
Search area	
From current position	Select this check box to start search from the current position
From start position	Select this check box to start search from the beginning of the object
From Address	Select this check box and specify the range in which the search is to be carried out
Search position	
Exhaustive search	Select this check box to search the entire object
Search at offset	Select this check box and specify the sector offset from which the search will start
Reverse	Select this check box to start the search in the reverse direction
Find all	Select this check box to search for all instances of the string to search. Search results will be shown in the Find Results pane.

Text/hexadecimal Editor will show the search progress.

Search results are shown on the Find Results pane. You may easily move to the required found item by clicking the item.

Navigating

You may quickly move to a particular part of the object. To move to a particular part of the object being viewed/edited, enter the required offset in the Go to Offset field between the buttons.

Bookmarking

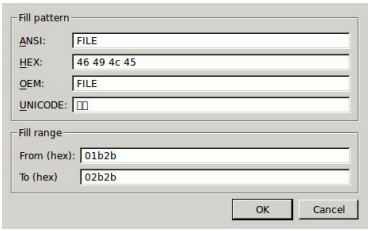
You may create bookmarks to easily move to those places. Right-click the cursor on the place you want to bookmark and select **Toggle Bookmark** on the context menu. The list of bookmarks appears in the Bookmark pane. You may easily move to the required bookmark by clicking it in the list.

You may control bookmarks on the **Edit** menu.

Filling an area with a pattern

To fill an area with a pattern, select **Fill** on the **Edit** menu, and specify the pattern and area on the Fill dialog box.

Fill **dialog box**



Fill options

Fill pattern	
HEX	Field for the pattern to fill the area in the hexadecimal representation
ANSI	Field for the pattern to fill the area in the ANSI encoding
OEM	Field for the pattern to fill the area in the OEM encoding
UNICODE	Field for the pattern to fill the area in the UNICODE encoding
Fill range	
From (hex)	Field for the start position of the area to fill with the pattern
To (hex)	Field for the end position of the area to fill with the pattern

3 Click the Save Changes button to save the changes

Other ways to save the changes made

- Select **Save Changes** on the **Edit** menu

or

- Press the **F2** key

> Viewer/Editor will save the changes on the object

YOU MUST BE ABSOLUTELY SURE OF WHAT AND WHERE YOU ARE WRITING!
Or you may completely lose all your data.

Selecting and saving an area in the Viewer/Editor

You may select an area in the Viewer / Editor panel and save it as a file.

To select and save an area in the Viewer/Editor **panel,**

1 **Right-click the beginning of the selection and select Select From** on the context menu

2 **Right-click the end of the selection and select Select To** on the context menu

Other ways to select an area

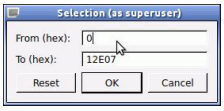
- Select **Select...** on the **Tools** menu and specify an area to select on the Select dialog box,

or

- Click the start point of the area and drag the mouse cursor to its end.

If you need to select an entire object, select **Select All** on the **Tools** menu or click the **Ctrl+A** key

Select **dialog box**



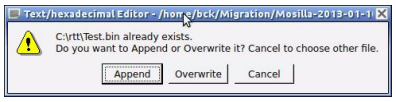
3 **Select an appropriate item in the Tools menu to save the data in a required format and specify its file name**

Select:

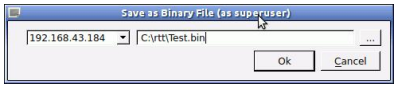
Save to Binary File...	to save the data in the binary format (default extension is `.bin`)
Save to Hexadecimal File	to save the data in the binary format (default extension is `.hex`)

on the **Tools** menu.

If you select an existing file, will ask you if you want to append or overwrite the file.



If a remote computer is connected for **Data Recovery over Network**, the Save as... dialog box will appear when you select a place to save the data. You may save it to the local or remote computer.



> Viewer/Editor will save the data in the file

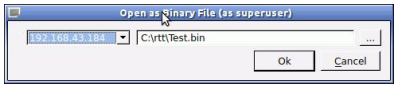
Loading data from an external file

You may load a data from a file and overwrite an area of the object opened in the Viewer/Editor panel.

To load binary data from a file and overwrite an area of the object opened in the Viewer/Editor **panel,**

1 **Select an area to overwrite and select Load from File... on the Tools menu**

If a remote computer is connected for **Data Recovery over Network**, the Open as Binary File dialog box will appear when you select a place to open the data file from. You may open it from the local or remote computer.



2 **Select the necessary file and load the data.**

> The area in the Viewer/Editor will be overwritten with the new data.

3.2 Creating Custom Patterns

You may create your own patterns yourself.

An example of a commented pattern parsing an AVI file.

The syntax of pattern description is similar to that of the XML language. The folder where the files should be placed is specified on the Main tab of the Settings dialog box.

Pattern structure

Pattern header

Each pattern starts with a standard header

```
<?xml version="1.0" encoding="utf-8"?>
```

Section `template`

Each pattern starts with a section giving to the pattern a name that will be shown in the parsed data pane.

Attributes:

`name`	Specifies the pattern name shown in the parsed data pane

Example:

```
<template name="AVI File LIST">
  ........
</template>
```

Section `signature`

Attributes:

`align <positive integer>`	Specifies if the data structure address is aligned (i.g., by a sector: 512)

This section contains elements `field` with hex-codes of the signature. The attribute `offset` specifies their offset from the start of the record. Field length is equal to the number of hex-codes.

Example:

```
<signature align="1">
   <field offset="0">46 49</field>
   <field offset="2">4c 45</field>
</signature>
```

Section `section`

Such sections contain all expressions and operations needed for the pattern to parse the data. A section name is shown in the parsed data pane. In fact, sections are virtual objects used to group logically connected `fields`. Sections can be nested.

The main section is not shown in the parsed data pane.

Section contain elements `field` which are actual data objects. `field` names are shown in the parsed data pane with their values.

Attributes:

`name`	Specifies the pattern name shown in the parsed data pane

Example:

```
<section name="JUNK">
  ....
</section>
```

List of All Objects in Patterns

Data types (in `field`)

- `integer`
  Sub-types:
  `int8`
  `int16`
  `int32`
  `int64`
  `uint8`
  `uint16`
  `uint32`
  `uint64`
  uintX
  Attributes:

`endian: (be | le | system)`	Optional. Default: `system`.
`base: (decimal | hex | octal)`	Optional. Specifies data representation. Default: `decimal`.
`as-offset: <expression>`	Optional. Specifies that this field is an offset and its value should be evaluated using the expression. A special variable `this` returns the value of this field.
`purpose: (offset | rsector | sector | cluster | rcluster)`	Optional. Specifies the type of the `as-offset` expression result . If this attribute is present, the attribute is necessary if the offset value should differ from the value of this field (variable `this`). `rsector` and `rcluster` are offsets relative to the absolute position of the pattern beginning.
`assigned-template: <TemplateName>`	Specifies the pattern name linked with this field. Ignored if the `as-offset` or `purpose` attributes are not specified.
`var: <Name>`	Optional. Specifies the name under which the value of this field can be accessed in expressions.

- `binary`
  Attributes:

`display-encoding: (hex | binary)`	Optional. Default: `hex`.
`size: <bytes>`	Mandatory.

- `char`
  Attributes:

`size: <bytes>`	Mandatory.
`codepage: (ansi | oem | utf8 | utf16)`	Optional. Specifies which codepage is used. Default: `ansi`.

- `filetime`
  Shows time in the Win32 format (64 bits)

- `unixtime`
  Shows time in the Unix format (seconds from 01/01/1970)

- `filetime`
  Shows time in the DOS format (date: hiword, time: loword)

- `bits`
  Attributes:

`size: <bytes>`	Mandatory.
`pos: <comma separated list of bit positions>`	Mandatory. Specifies bit positions in a data block.

Commands

- `goto`
  Specifies a jump to a specified offset (either absolute or relative one)
  Attributes:

`address: <expression>`	Specifies an absolute address to jump to.
`offset: <expression>`	Specifies a relative offset to jump by.

  One and only one of the attributes should always be specified.

- `if`
  Evaluates a condition specified in the `test` attribute and, if the condition is true, reads fields specified in this tag.
  Attribute:

`test: <expression>`	Sets a condition to test against.

- `repeat`
  Reads the fields specified in the tag until the exit condition is equal to 0 or specified times
  Attributes:

`count: <expression>`	`<expression>` is evaluated one time upon entering the block. Internal elements are read the specified number of times.
`test: <expression>`	`<expression>` is evaluated upon entering the block. Similar to the C++ construction `while(...) {}`.
`test: <expression>`	`<expression>` is evaluated upon exiting the block. Similar to the C++ construction `do {} while(...)`.

- `setvar`
  Sets the value of an internal variable. As an example, this command is convenient to store the current offset. The value of the current offset is stored in a predefined variable `offset`.
  Attributes:

`var: <string>`	Specifies the name of the variable.
`expr: <expression>`	Specifies an expression which result will be assigned to the variable.

Expressions

Expressions in the patterns are arithmetic expressions which syntax is similar to that of the C language, including operation preceding.
The following operations are supported:
`+ - * / & | > < <= >= != == || &&`

Predefined variables

- `offset`
  An offset in bytes from the pattern beginning data is currently read at.

- `start_position`
  An absolute position of the pattern beginning. `offset` + `start_position` = absolute offset.

- `this`
  This variable exists only within the context of the `ass-offset` expression evaluation and is the current value of the data field for which that expression is specified

3.3 Pattern Example I

Below is an example of a commented pattern parsing an AVI file.

```
<?xml version="1.0" encoding="utf-8"?>
<!-- A pattern section. The pattern name is AVI File. -->
<template name="AVI File">
  <!-- A template signature section. Alignment is 1. -->
  <signature align="1">
    <!-- A 4-byte signature at offset 0x00. -->
    <field offset="0x00">52 49 46 46</field> <!-- ANSI: RIFF -->
    <!-- A 4-byte signature at offset 0x08. -->
    <field offset="0x08">41 56 49 20</field> <!-- ANSI: LIST -->
  </signature>

  <!-- A data section. Its name is AVI File. This is the main data section. It is not shown in the parsing tree as a section (its name is ignored). -->
  <section name="AVI File">
    <!-- The first 4 bytes are read and shown as an ANSI string. -->
    <field type="char" size="4" name="Signature: RIFF" var="signature"/>
    <!-- The current position is moved to the beginning of the file. -->
```

```
<goto offset="-4"/>
```
<!-- The first 4 bytes in the file are read and shown as an unsigned integer. The internal variable `signature` gets the value of the field. -->
```
 <field type="uint32" base="hex" name="Signature RIFF as unsigned integer in hex
format" var="signature"/>
```

<!-- A test against the condition (`signature == RIFF`) -->
```
<if test="signature == 0x46464952">
```
<!-- ANSI: RIFF -->
<!-- The next 4 bytes are read and shown as an unsigned integer. The internal variable `dataSize` gets the value of the field. -->
```
  <field type="uint32" name="Size of the data in file" var="dataSize"/>
```
<!-- A new internal variable `endOfFile` is created and the `expr` field evaluates its value.-->
```
  <setvar var="endOfFile" expr="offset + dataSize - 8"/>
```
<!-- The next 4 bytes is read and shown as an ANSI string. -->
```
  <field type="char" size="4" name="File type"/>
```

<!-- A new section named `DATA` is created -->
```
  <section name="DATA">
```
<!-- A new internal variable `chunksOffset` is created, the expr filed evaluating its value. This variable gets the absolute value of template offset. -->
```
    <setvar var="chunksOffset" expr="start_position"/>
```

<!-- A loop is created. Its condition is set in the test field (while the `endOfFile` variable is greater then the current position.) -->
```
    <repeat test="endOfFile > offset">
```
<!-- 4 bytes are read and shown as an ANSI string. -->
```
      <field type="char" size="4" name="Signature"/>
```
<!-- The current position is moved backwards by 4 bytes. -->
```
      <goto offset="-4"/>
```
<!-- The same 4 bytes are read and shown as an unsigned integer. The internal variable `signature` gets this value. -->
```
      <field type="uint32" name="Signature as unsigned integer" var="signature"/
>
```

<!-- A test against the condition (`signature == LIST`) -->
```
      <if test="signature == 1414744396">
```
<!-- ANSI: LIST -->
<!-- The section is shown. Its name is LIST -->
```
        <section name="LIST">
```
<!-- The current position is moved backward by 4 bytes. -->
```
          <goto offset="-4"/>
```
<!-- The 4 bytes are read and shown as an unsigned hexadecimal integer. This field has the attributes `offset` and `assigned-template`. If the user double-clicks this field, the `AVI File LIST` pattern

will be invoked and the current pattern position will be moved to the address specified in as-offset.-->

```
                    <field type="uint32" base="hex" name="Signature LIST as unsigned
integer in hex format" as-offset="start_position + offset - 4" assigned-
template="AVI File LIST"/>
                <!-- The next 4 bytes are read and shown as an unsigned integer. The listSize variable gets
its value. -->
                            <field type="uint32" name="Size of the data in the list"
var="listSize"/>
                <!-- The 4 bytes are read and shown as an ANSI string. -->
                <field type="char" size="4" name="List type"/>
                <!-- The current position is moved backward by 4 bytes. -->
                <goto offset="-4"/>
                <!-- The same 4 bytes are shown as an unsigned hexadecimal integer. The listType variable
gets its value.-->
                <field type="uint32" base="hex" name="List type as unsigned integer in
hex format" var="listType"/>

                <!-- A test against condition (type == movi) -->
                <if test="listType == 0x69766f6d"> <!-- ANSI: movi -->
                  <!-- The chunksOffset variable gets the value evaluated in the expr attribute. -->
                  <setvar var="chunksOffset" expr="start_position + offset - 4"/>
                 </if>

                <!-- The current position is moved to the address evaluated in the address attribute. -->
                <goto address="offset + listSize - 4"/>
              </section>
             </if>

            <!-- A test against condition (signature == JUNK) -->
            <if test="signature == 1263424842"> <!-- ANSI: JUNK -->
              <!-- The section is shown with the JUNK name. -->
               <section name="JUNK">
                    <!-- The next 4 bytes are read and shown as an unsigned integer. The internal variable
junkSize gets its value. -->
                            <field type="uint32" name="Size of the data of the junk"
var="junkSize"/>
                <!-- The current position is moved by junkSize bytes forward. -->
                <goto offset="junkSize"/>
               </section>
             </if>

            <!-- A test against condition (signature == idx1) -->
```

```
          <if test="signature == 829973609"> <!-- ANSI: idx1 -->
            <!-- The section is shown with the idx1 name. -->
            <section name="idx1">
                  <!-- The next 4 bytes are read and shown as an unsigned integer. The internal variable idxSize gets its value. -->
                        <field type="uint32" name="Size of the data of the idx1" var="idxSize"/>
              <!-- The section is shown with the First AVIINDEXENTRY name. -->
              <section name="First AVIINDEXENTRY">
                <!-- The 4 bytes are read and shown as an ANSI string. -->
                <field type="char" size="4" name="Chunck id"/>
                <!-- The next 4 bytes are read and shown as an unsigned hexadecimal integer. -->
                <field type="uint32" base="hex" name="Flags"/>
                 <!-- The next 4 bytes are read ans shown as an unsigned hexadecimal integer. The offset attribute is evaluated for this field as a sum of the chunksOffset variable and valued of this field. -->
                          <field type="uint32" base="hex" name="Chunk offset" as-offset="chunksOffset + this"/>
                <!-- The next 4 bytes are read and shown as an unsigned integer. -->
                <field type="uint32" name="Chunk size"/>
              </section>
              <!-- The current position is moved by idxSiz bytes forward. -->
              <goto offset="idxSize"/>
            </section>
          </if>

          <!-- A test against the condition. &amp;&amp; is a logical AND (&&) -->
               <if test="signature != 1414744396 &amp;&amp; signature != 1263424842 &amp;&amp; signature != 829973609">
            <!-- An empty section is shown. Its name is Unknown signature found -->
            <section name="Unknown signature found">
            </section>
            <!-- The current position is moved to the address set in the endOfFile variable. -->
            <goto address="endOfFile"/>
           </if>
        </repeat>
      </section>
    </if>
  </section>
</template>
```

3.4 Pattern Example II

```
<?xml version="1.0" encoding="utf-8"?>
<!-- A pattern section. The pattern name is AVI File LIST -->
<template name="AVI File LIST">
  <!-- A template signature section. Alignment is 1. -->
  <signature align="1">
    <!-- A 4-byte signature at offset 0x00. -->
    <field offset="0x00">4C 49 53 54</field> <!-- ANSI: LIST -->
  </signature>

  <!-- A data section. Its name is AVI File LIST. This is the main data section. It is not shown in the parsing tree as a section (its name is ignored).-->
  <section name="AVI File LIST">
    <!-- The first 4 bytes are read and shown as an ANSI string. -->
    <field type="char" size="4" name="Signature: LIST"/>
    <!-- The current position is moved to the beginning of the file (4 bytes backward). -->
    <goto offset="-4"/>
    <!-- The first 4 bytes in the file are read and shown as an unsigned integer. The internal variable signature gets the value of the field. -->
    <field type="uint32" name="Signature LIST as unsigned integer" var="signature"/>

    <!-- A test against the condition (signature == LIST) -->
    <if test="signature == 1414744396"> <!-- ANSI: LIST -->
      <!-- The next 4 bytes are read and shown as an unsigned integer. The internal variable listSize gets its value. -->
      <field type="uint32" name="Size of the data in the list" var="listSize"/>
      <setvar var="endOfList" expr="offset + listSize"/>

      <field type="char" size="4" name="List type"/>
      <goto offset="-4"/>
        <field type="uint32" base="hex" name="List type as unsigned integer in hex format" var="listType"/>

      <!-- A test against condition (listType == movi) -->
      <if test="listType == 0x69766f6d"> <!-- ANSI: movi -->
        <!-- This chunk is not to be parsed. The current position is moved to the end of the chunk. -->
        <goto address="endOfList"/>
      </if>

      <setvar var="mediaType" expr="0"/>
       <repeat test="endOfList > offset - 8">
```

```
        <section name="CHUNK">
          <field type="char" size="4" name="Chunk ID"/>
          <goto offset="-4"/>
          <field type="uint32" name="Chunk ID as unsigned integer" var="chunkId"/>
          <if test="chunkId == 1414744396"> <!-- ANSI: LIST -->
            <goto offset="-4"/>
    <field type="uint32" base="hex" name="LIST chunk ID as unsigned integer in hex
format" as-offset="start_position + offset - 4" assigned-template="AVI File LIST"/>
          </if>

          <field type="uint32" name="Size of the data in the chunk" var="chunkSize"/
>
          <setvar var="endOfChunk" expr="offset + chunkSize"/>

          <!-- Rounding the value of the variable endOfChunk to a number divisible by 2. -->
          <if test="endOfChunk &amp; 1">
            <setvar var="endOfChunk" expr="endOfChunk &amp; 0xFFFFFFFE"/>
            <setvar var="endOfChunk" expr="endOfChunk + 2"/>
          </if>

          <if test="chunkId == 1751742049"> <!-- ANSI: avih -->
            <field type="uint32" name="Number of microseconds between frames"/>
            <field type="uint32" name="Approximate maximum data rate of the file"/>
            <field type="uint32" name="Alignment for data, in bytes"/>
               <field type="uint32" name="Bitwise combination of zero or more of the
flags"/>
            <field type="uint32" name="Total number of frames of data in the file"/>
            <field type="uint32" name="Initial frame for interleaved files"/>
            <field type="uint32" name="Number of streams in the file"/>
            <field type="uint32" name="Suggested buffer size for reading the file"/>
            <field type="uint32" name="Width of the AVI file in pixels"/>
            <field type="uint32" name="Height of the AVI file in pixels"/>
            <field type="binary" size="16" name="Reserved"/>
          </if>

          <if test="chunkId == 1852994675"> <!-- ANSI: strn -->
            <field type="char" size="chunkSize" name="Stream name"/>
          </if>

          <if test="chunkId == 1752331379"> <!-- ANSI: strh -->
            <field type="char" size="4" name="Type"/>
```

```
            <goto offset="-4"/>
               <field type="uint32" base="hex" name="Type as unsigned integer in hex
format" var="type"/>
            <setvar var="mediaType" expr="type"/>
            <field type="char" size="4" name="Handler (codec)"/>
            <field type="uint32" base="hex" name="Flags"/>
             <field type="uint32" name="Number of the first block of the stream that
is present in the file"/>
            <field type="uint32" name="Scale"/>
            <field type="uint32" name="Rate"/>
            <field type="uint32" name="Start time of stream"/>
               <field type="uint32" name="Size of stream in units as defined in Rate
and Scale"/>
              <field type="uint32" name="Size of buffer necessary to store blocks of
that stream"/>
            <field type="uint32" name="Quality"/>
               <field type="uint32" name="Sample size (number of bytes of one stream
atom)"/>
          </if>

          <if test="chunkId == 1718776947"> <!-- ANSI: strf -->
            <if test="mediaType == 0x73646976"> <!-- ANSI: vids -->
              <section name="BITMAPINFOHEADER">
                        <field type="uint32" name="Number of bytes required by the
structure"/>
                <field type="int32" name="Width of the bitmap, in pixels"/>
                <field type="int32" name="Height of the bitmap, in pixels"/>
                <field type="uint16" name="Number of planes for the target device"/>
                <field type="uint16" name="Number of bits-per-pixel"/>
                    <field type="uint32" name="Type of compression for a compressed
bottom-up bitmap"/>
                <field type="uint32" name="Size, in bytes, of the image"/>
                     <field type="int32" name="Horizontal resolution, in pixels-per-
meter, of the target device for the bitmap"/>
                  <field type="int32" name="Vertical resolution, in pixels-per-meter,
of the target device for the bitmap"/>
                   <field type="uint32" name="Number of color indexes in the color
table that are actually used by the bitmap"/>
                <field type="uint32" name="Number of color indexes that are required
for displaying the bitmap"/>
              </section>
            </if>
```

```
            <if test="mediaType == 0x73647561"> <!-- ANSI: auds -->
              <section name="WAVEFORMATEX">
                <field type="uint16" name="Waveform-audio format type"/>
                 <field type="uint16" name="Number of channels in the waveform-audio
data"/>
                      <field type="uint32" name="Sample rate, in samples per second
(hertz)"/>
                  <field type="uint32" name="Required average data-transfer rate, in
bytes per second, for the format tag"/>
                <field type="uint16" name="Block alignment, in bytes"/>
                   <field type="uint16" name="Bits per sample for the Waveform-audio
format type"/>
                        <field type="uint16" name="Size, in bytes, of extra format
information appended to the end of the WAVEFORMATEX structure"/>
              </section>
            </if>
          </if>

          <goto address="endOfChunk"/>
        </section>
      </repeat>

    </if>

    <if test="signature != 1414744396">
      <section name="Invalid LIST signature found">
      </section>
    </if>

  </section>
</template>
```

IV Technical Information and Troubleshooting

This chapter covers various technical issues and troubleshooting.

- **IntelligentScan technology**
- **Data Recovery Issues**
- **Extended Information Recovery**
- **Data Formats**
- **Data Recovery on HFS/HFS+ file system**
- **Bad Sectors**
- **Memory Usage**
- **Forensic Mode**
- **R-Studio Switches**
- **Properties Tab**

R-Studio Features
Contact Information and Technical Support
Data Recovery Using R-Studio
Basic File Recovery
Advanced Data Recovery
Mass File Recovery
Volume Sets and RAIDs
Data Recovery over Network
Text/hexadecimal editor
R-Studio Emergency
R-Studio Agent Emergency

4.1 IntelligentScan Technology

R-Studio uses a unique ***IntelligentScan*** technology when it tries to recover the data on the area being scanned.

While scanning the selected area, **R-Studio** reads data directly from the disk, analyzes them, and tries to determine a record to which the data belong. The following record types are possible:

- MBR record
- NTFS Boot Sector record
- FAT Boot Sector record
- MFT record
- NTFS Folder record
- FAT record
- FAT Folder record
- Ext2/3/4FS SuperBlocks record
- UFS/FFS SuperBlock record
- HFS/HFS+ Volume Header
- HFS/HFS+ BTree+ Node

All these record types have different, but known, structure. Knowing valid values of record fields and relations between them for each record type, **R-Studio** determines a record type for the data. If such record type cannot be unambiguously determined, the data are assigned to the most probable record type. The same data can be assigned to several record types, with a certain probability for each assignment. A list of possible files is generated from these records.

R-Studio generates a record list for each record type. This list contains references to records assigned to a record type from the list with their assignment probability. The same data can be included into different record lists. Then **R-Studio** analyzes relations between elements in each list and between different lists, and generates a list of found partitions with their parameters, such as partition start point and probable size, file system type, cluster size, and existence probability.

Using the file list and partition list, **R-Studio** reconstructs file systems and files on the found partitions. One file can be attributed to several different partitions.

When the entire disk or its part has been scanned, **R-Studio** shows all found partitions. Then the parameters of the found partitions may be manually corrected, if additional information on them is available.

Using the *IntelligentScan* technology, **R-Studio** can recover files not only on new and existing partitions. It also can find and recover data on partitions that have been deleted or reformatted. If, for example, there was an NTFS partition, which later was reformatted as a FAT partition, **R-Studio** will show two partitions on the same place on the disk, one having the FAT file system, the other the NTFS. Then, found files can be recovered.

The ***IntelligentScan*** technology makes **R-Studio** a very powerful data recovery tool, but it is not omnipotent. As it uses probabilistic approach to data reconstruction, it cannot guarantee 100% correct results. Moreover, even if **R-Studio** has reconstructed data structure correctly, it is impossible to guarantee that all found files will be completely and correctly recovered, as new data may be already written over the old files. See the **Data Recovery Issues** topic for details.

4.2 Data Recovery Issues

NEVER TRY TO SAVE RECOVERED FILES/FOLDERS TO THE SAME LOGICAL DISK WHERE THEY RESIDE!!!

Or you may obtain unpredictable results and lose all of your data.

R-Studio writes directly to a hard drive only when writing recovered data and from its hex editor, if writing is enabled. In all other actions, **R-Studio** only reads data and analyzes them, and never modifies data on the hard drives being analyzed.

Most operating systems use lazy-write. So, there is a time lag between file actions and actual changes on data on a hard drive. **R-Studio** analyzes data on hard drives only. That is why it does not always detect recent changes in data structure.

Most operating systems constantly write their service information on hard drives. Such writing is especially intensive during startup and shutdown procedures. When an operating system deletes a file/folder, it treats the space where it has resided as empty and may write something in this place. If this happened, the file/folder and its parameters may be detected correctly, but its data may be lost.

Folder names like **$$$Folder58448** on NTFS partitions mean that the folder has not been found on the drive but some references to it have been. For example, folders My documents, Work, Photos have been found and all they have one parent folder, whose description has not actually been found on the disk, so its name is unknown and therefore represented as **$$$Folder58448**. It may happen that the description of such folders was outside of the scan area, so try to enlarge the region or scan the entire hard drive. If that does not help, most likely that the

description of the folder has been overwritten.

Folder names like **$ROOT58448** on FAT partitions mean that some folders have been found, but they cannot be included into the folder structure for this FAT partition. Sometimes, such folders may contain other folder structures.

If you recover a file, and it appears that the file contains wrong data, try to do the following:

- **Scan**:
  the logical disk, if the file has been just deleted.
  the hard drive, if the data structure is damaged more seriously.
- **Search for the file** to be restored on all found partitions and try to recover it from all found partitions. Check each recovered file to ensure that it contains correct data. As soon as you found the partition from which the file is recovered correctly, use this partitions to recover all other deleted files.

If there are several deleted files to be restored, you should use a file larger than 2KB to select the required partition.

Cross-Linked Folders

Often **R-Studio** finds several FAT folder records that contain the same data. Such folders are called *cross-linked*. **R-Studio** marks such folders with an arrow mark: ☐ .Trashes

R-Studio attributes the content of cross-linked folders to one folder called a *target folder*. When recovering, **R-Studio** places the content to the target folder.

To view the list of cross-linked folders,

1 **Right-click a cross-linked folder and select Cross Linked Folders on the context menu**

> **A list of cross-linked folders will appear**
  You may go to any folder in this list by clicking it.

To find a target folder,

* **Right-click a cross-linked folder and select Go Target on the context menu,** or
  Select the cross-linked folder and select **Goto Target** on the **File** menu
  If **Go Target** is gray, this folder is already the target folder.

To set the target folder manually,

* **Right-click a cross-linked folder and select Set As Default Target on the context menu**, or
  Select the cross-linked folder and select **Set As Default Target** on the **File** menu.
  If **Set As Default Target** is gray, this folder is already the target folder.

Questionable Folders

Sometimes, **R-Studio** may find FAT records, which look like folders, but their content is invalid. For example, file names have invalid characters, date, time, and size, or other file attributes may look strange. Please note that **R-Studio** correctly recognizes localized names. **R-Studio** treats such records as folders, but does not analyze their content and structure. You can manually scan such folders, but results may be unpredictable. Usually, such scan reveals garbage.

R-Studio marks such folders with a question mark. ☐ Accordion

To re-scan an object,

* **Right-click a questionable folder on the R-Studio's** Folders **panel and select Rescan on the context menu**, or

  Select the questionable folder and select **Rescan** on the **File** menu.

4.3 Extended Information Recovery

R-Studio supports recovery of compressed files, alternative data streams, encrypted files, file security and extended file attributes. If the **R-Studio** host OS and the file system of the disk you are going to save file to support any particular extended information, it will be saved with the file, too. Otherwise, the extended information will be saved as separate files with the same name as the restored file and extension showing the type of the extended information. Below is a quick reference for the host OS and file system of the target drive.

Extended Information	Required host OS	Required target disk FS
Encrypted files	Windows 2000/XP/2003/ Vista/2008/7	NTFS
Alternative data streams	Windows NT/2000/XP/2003/ Vista/2008/7	NTFS
File security	Windows NT/2000/XP/2003/ Vista/2008/7	NTFS
Extended file attributes	Windows NT/2000/XP/2003/ Vista/2008/7	NTFS or FAT

4.4 Data Formats

You may enter data in all numerical fields either in sectors or in bytes. If there is no letters are after the number, **R-Studio** assumes the numbers are in bytes.

Decimal numbers are entered as they are: `2372354`

Hexadecimal numbers are entered as `0x23Fa67` or `23Fa67 hex`.

The following case-insensitive notation is possible:

`b`	1 byte
`kb`	1 kb = 2^10=1024 bytes
`mb`	1 mb = 2^20=104857 bytes
`gb`	1 gb = 2^30=1073741824 bytes
`tb`	1 tb = 2^40=1099511627776 bytes
`eb`	1 eb = 2^50=1125899906842624 bytes
`hex`	A hexadecimal number
`sec (sector)`	A number is in sectors

4.5 Data Recovery on HFS/HFS+ File System

When deleting a file, Mac OS X deletes system BTree+ records describing the file. Therefore, it is hard to recover such file directly. Those records may remain in:

1. The swap file (if the deleted file has been deleted recently).
2. In the journal (if the HFS+ journaling is on, and the deleted file has been CREATED recently)

Actually, if a file has been deleted, chances that the records would be found are small. To greatly increase the chances to recover deleted files successfully , you may actively use scanning with enabled Known Files Types.

Note: All above is correct for intentionally deleted files. In case of a corrupted file system, HFS/HFS+ can be recovered quite successfully.

When recovering files with HFS+-specific attributes (resource fork, finder info, etc.), **R-Studio** saves them in the so-called AppleDouble format. When they are copied to an HFS+ disk under Mac OS X, those attributes will be automatically restored.

4.6 Bad Sectors

Quite often, drives from which the data are to be recovered have bad sectors, or those sectors that are very hard, even impossible, to read, mostly due to hardware problems. **R-Studio** tries to read such sectors several times. The number of tries is specified either on the Settings/Bad Sectors dialog box, or on the Properties tab, the Drive Control section, for each drive separately.

When **R-Studio** encounters such bad sectors while performing various tasks and they appear unreadable, it treats them as follows:

Object images:

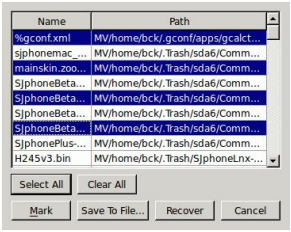
R-Studio fills the space in the image file where the bad sectors should be with the pattern specified in the Pattern to fill bad blocks field on the Settings/Bad Sectors dialog box. Please note that **R-Studio** writes the pattern on the image, not on the source drive.

Files

If Skip files with bad sectors on the Recovery dialog box is cleared, **R-Studio** fills bad sectors in the recovered file with the pattern specified on the the Settings/Bad Sectors dialog box. Information about such files will appear in the Log.

If Skip files with bad sectors on the Recovery dialog box is selected, **R-Studio** skips files with bad sectors and displays their list on the Files with bad sectors dialog box when the recovery has been completed. You may select files to immediately recover them or to mark for later recovery. You may also save this list to a text file.

Files with bad sectors **dialog box**



Files with bad sectors Buttons

Select All	Click this button to select all files in the list.
Clear All	Click this button to unselect all selected files.
Mark	Click this button to mark all selected files in the list.
Save to File	Click this button to save the list of files with bad sectors to a text file.
Recover	Click this button to immediately recover selected files. The bad sectors in the recovered files will be filled with the pattern specified in the Pattern to fill bad blocks field on the Settings/Bad Sectors dialog box.

Objects edited in the Text/hexadecimal editor/viewer

Bad sectors in the objects viewed/edited in the **Text/hexadecimal editor** are shown as filled with the pattern specified in the Pattern to fill bad blocks field on the Settings/Bad Sectors dialog box.

4.7 Memory Usage

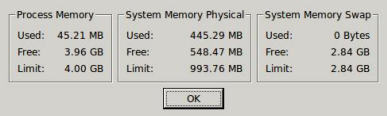
You may see how much memory **R-Studio** uses while performing a data recovery task. This is especially useful when scanning large disks on a computer with limited resources. You may specify memory control options on the Memory usage tab in the **R-Studio Settings**

To view memory usage,

1 Select Memory usage on the Tools menu

> R-Studio will show the total memory in your computer and how much memory it uses

Memory usage **dialog box**



Memory usage

Process Memory	Shows how much memory **R-Studio** uses. Limit shows how much memory your system can virtually allocate to **R-Studio**. Actual memory allocation depends also on the RAM and swap file sizes.
System Memory Physical	Shows how much RAM is in your system
System Memory Swap	Shows how much virtual memory is in your system

4.8 Forensic Mode

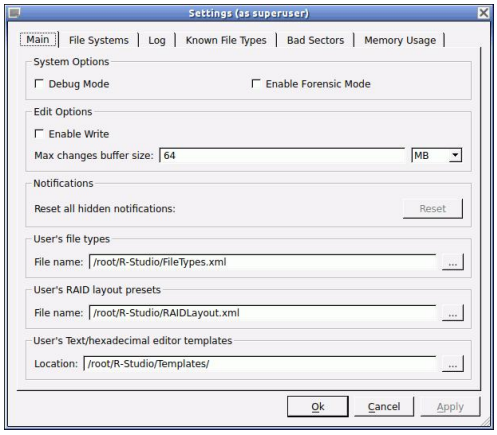
Note: This feature is available for the Technician version of **R-Studio** only!

When this mode is enabled, **R-Studio** will generate a forensic data collection audit log that can be presented at court hearings. This log includes information about a hardware configuration on which the forensic data collection takes place and MD5 for recovered files.

Note: A new log will be generated each time the hardware configuration is changed (a hard drive is connected/ disconnected, an external USB device is connected/disconnected, etc)

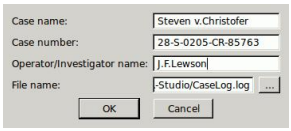
To enable this feature,

* **Select Enable Forensic Mode on the** Main **tab of the** Settings **dialog box.**



Each time you start file recovery, the Forensic Log Settings dialog box will appear.

Forensic Log Settings **dialog box**



Enter the required information and click the **OK** button to go to the Recovery dialog box.

While recovering the files, **R-Studio** will create forensic data collection audit log in the specified folder. Below is an example of such log.

```
****************************** Forensic Data Collection Audit Log
******************************

R-STUDIO Network Technician 1.0.106/11/9/10

Case Name: Steven v.Christofer
Case Number: 28-S-0205-CR-85763
Operator / Investigator Name: J.F.Lewson

************************************* Drives Information
*************************************

- Drive Number 0 --------------------------------
* Drive Type [256 bytes]: Computer,Local Computer
* Name [30 bytes]: Local Computer
* OS [144 bytes]: Linux 2.6.32-25-generic-pae #45-Ubuntu SMP Sat Oct 16 21:01:33 UTC
2010
* System [10 bytes]: i686

- Drive Number 1 --------------------------------
* Drive Type [256 bytes]: Physical Drive,Disk
* Name [34 bytes]: ST3120811AS3.AAE
* OS Object [18 bytes]: /dev/sda
* R-Studio Driver [18 bytes]: ata_piix
* Size [8 bytes]: 111 Gb (234441648 sec)
* Sector Size [4 bytes]: 512 b
```

```
# I/O Tries [4 bytes]: Default
+ Drive Control [4 bytes]:
  # Maximum Transfer [4 bytes]: 32768
  # I/O Unit [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 4096
+ Physical Drive Geometry [4 bytes]:
  * Cylinders [8 bytes]: 14593
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512 b
* Partition Layout Sector Size [4 bytes]: 512 b
+ Device Identification [4 bytes]:
  * Product [64 bytes]: ST3120811AS
  * Firmware [16 bytes]: 3.AAE
  * Serial Number [32 bytes]: 6PT0J1FH
* Bus Type [4 bytes]: SerialATA
+ IDE Properties [4 bytes]:
  * Buffer [10 bytes]: 8 MB
  * ECC Bytes [2 bytes]: 4
  * PIO Modes [16 bytes]: 1,2,3,4
  * DMA Modes [12 bytes]: 0,1,2
  * UltraDMA Modes [28 bytes]: 0,1,2,3,4,5,6
  * Current Mode [22 bytes]: UltraDMA 6

- Drive Number 2 --------------------------------
* Drive Type [256 bytes]: Physical Drive,Disk
* Name [30 bytes]: ST380817AS3.42
* OS Object [18 bytes]: /dev/sdb
* R-Studio Driver [18 bytes]: ata_piix
* Size [8 bytes]: 74 Gb (156301488 sec)
* Sector Size [4 bytes]: 512 b
# I/O Tries [4 bytes]: Default
+ Drive Control [4 bytes]:
  # Maximum Transfer [4 bytes]: 32768
  # I/O Unit [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 4096
+ Physical Drive Geometry [4 bytes]:
  * Cylinders [8 bytes]: 9729
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512 b
* Partition Layout Sector Size [4 bytes]: 512 b
+ Device Identification [4 bytes]:
  * Product [64 bytes]: ST380817AS
  * Firmware [16 bytes]: 3.42
  * Serial Number [32 bytes]: 4MR29A6X
* Bus Type [4 bytes]: SerialATA
+ IDE Properties [4 bytes]:
  * Buffer [10 bytes]: 8 MB
  * ECC Bytes [2 bytes]: 4
  * PIO Modes [16 bytes]: 1,2,3,4
  * DMA Modes [12 bytes]: 0,1,2
  * UltraDMA Modes [28 bytes]: 0,1,2,3,4,5,6
```

```
  * Current Mode [22 bytes]: UltraDMA 6

- Drive Number 3 --------------------------------
* Drive Type [256 bytes]: Physical Drive,Disk
* Name [48 bytes]: SAMSUNG HD642JJ1AA01110
* OS Object [18 bytes]: /dev/sdc
* R-Studio Driver [18 bytes]: ata_piix
* Size [8 bytes]: 596 Gb (1250263728 sec)
* Sector Size [4 bytes]: 512 b
# I/O Tries [4 bytes]: Default
+ Drive Control [4 bytes]:
  # Maximum Transfer [4 bytes]: 32768
  # I/O Unit [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 4096
+ Physical Drive Geometry [4 bytes]:
  * Cylinders [8 bytes]: 77825
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512 b
* Partition Layout Sector Size [4 bytes]: 512 b
+ Device Identification [4 bytes]:
  * Product [64 bytes]: SAMSUNG HD642JJ
  * Firmware [16 bytes]: 1AA01110
  * Serial Number [32 bytes]: S1AFJ1MQ400283
* Bus Type [4 bytes]: SerialATA-II
+ IDE Properties [4 bytes]:
  * Buffer [118 bytes]: 16 MB, Dual ported multi-sector buffer with a read caching
  * ECC Bytes [2 bytes]: 4
  * PIO Modes [16 bytes]: 1,2,3,4
  * DMA Modes [12 bytes]: 0,1,2
  * UltraDMA Modes [32 bytes]: 0,1,2,3,4,5,6,7
  * Current Mode [22 bytes]: UltraDMA 6

- Drive Number 4 --------------------------------
* Drive Type [256 bytes]: Physical Drive,CDROM
* Name [60 bytes]: TSSTcorp CDW/DVD SH-M522CTS07
* OS Object [20 bytes]: /dev/scd0
* R-Studio Driver [18 bytes]: ata_piix
* Size [8 bytes]: 1023 Mb (2097151 sec)
* Sector Size [4 bytes]: 2048 b
# I/O Tries [4 bytes]: Default
+ Drive Control [4 bytes]:
  # Maximum Transfer [4 bytes]: 32768
  # I/O Unit [4 bytes]: 2048
  # Buffer Alignment [4 bytes]: 4096
+ Device Identification [4 bytes]:
  * Product [64 bytes]: TSSTcorp CDW/DVD SH-M522C
  * Firmware [16 bytes]: TS07
* Bus Type [4 bytes]: IDE/ATAPI
+ IDE Properties [4 bytes]:
  * PIO Modes [16 bytes]: 1,2,3,4
  * DMA Modes [12 bytes]: 0,1,2
  * UltraDMA Modes [12 bytes]: 0,1,2
```

```
  * Current Mode [22 bytes]: UltraDMA 2

- Drive Number 5 --------------------------------
* Drive Type [256 bytes]: Volume,Disk
* Name [4 bytes]: /
* Mount Points [4 bytes]: /
* OS Object [20 bytes]: /dev/sdc5
* Size [8 bytes]: 190 Gb (400005120 sec)
* Sector Size [4 bytes]: 512 b
* Partition Offset [8 bytes]: 402 Gb (844298240 sec)
* Partition Size [8 bytes]: 190 Gb (400005120 sec)
+ Ext2/Ext3/Ext4 Information [4 bytes]:
  # FS Character Set [4 bytes]: OEM
  * Block Size [4 bytes]: 4096 b (8 sec)
  * First SuperBlock Offset [4 bytes]: 1024 b (2 sec)
  * Blocks Per Volume [4 bytes]: 50000640
  * INodes Per Volume [4 bytes]: 12500992
  * Creator OS [4 bytes]: Linux
  * Major Version [4 bytes]: 1
  * Minor Version [2 bytes]: 0
  * Last Mount Time [8 bytes]: 11.11.2010 12:43:33
  * Last Write Time [8 bytes]: 29.9.2010 11:18:58
  * Last Check Time [8 bytes]: 29.9.2010 11:18:58
  * Volume Size [8 bytes]: 190 Gb (400005120 sec)
# I/O Tries [4 bytes]: Default
+ Drive Control [4 bytes]:
  # Maximum Transfer [4 bytes]: 32768
  # I/O Unit [4 bytes]: 512
  # Buffer Alignment [4 bytes]: 4096
+ Physical Drive Geometry [4 bytes]:
  * Cylinders [8 bytes]: 24899
  * Tracks Per Cylinder [4 bytes]: 255
  * Sectors Per Track [4 bytes]: 63
  * Sector Size [4 bytes]: 512 b

- Drive Number 6 --------------------------------
* Drive Type [256 bytes]: Partition,Active
* Name [22 bytes]: Partition1
* Size [8 bytes]: 29996 Mb (61432497 sec)
* Partition Offset [8 bytes]: 32256 b (63 sec)
* Partition Size [8 bytes]: 29996 Mb (61432497 sec)
* Partition Type [256 bytes]: NTFS/HPFS
+ NTFS Information [4 bytes]:
  * Cluster Size [4 bytes]: 4096 b (8 sec)
  * MFT Record Size [4 bytes]: 1024 b
  * MFT Position [8 bytes]: 3072 Mb (6291456 sec)
  * MFT Mirror Position [8 bytes]: 14998 Mb (30716248 sec)
  * Index Block Size [4 bytes]: 4096 b
  * Sector Size [4 bytes]: 512 b
  * Volume Size [8 bytes]: 29996 Mb (61432496 sec)

- Drive Number 7 --------------------------------
* Drive Type [256 bytes]: Partition,Primary
```

```
* Name [22 bytes]: Partition2
* Size [8 bytes]: 29996 Mb (61432560 sec)
* Partition Offset [8 bytes]: 29996 Mb (61432560 sec)
* Partition Size [8 bytes]: 29996 Mb (61432560 sec)
* Partition Type [256 bytes]: Mac OS X HFS+
+ HFS/HFS+ Information [4 bytes]:
  * HFS Type [32 bytes]: HFS+, Journaled
  * Block Size [4 bytes]: 4096 b (8 sec)
  * HFS Version [4 bytes]: 4
  * Create Time [8 bytes]: 1.5.2007 19:16:12
  * Last Write Time [8 bytes]: 27.10.2010 18:56:14
  * Last Check Time [8 bytes]: 2.5.2007 2:16:12
  * Volume Size [8 bytes]: 29996 Mb (61432560 sec)

- Drive Number 8 --------------------------------
* Drive Type [256 bytes]: Partition,Primary
* Name [22 bytes]: Partition3
* Size [8 bytes]: 24003 Mb (49158900 sec)
* Partition Offset [8 bytes]: 58 Gb (122865120 sec)
* Partition Size [8 bytes]: 24003 Mb (49158900 sec)
* Partition Type [256 bytes]: Ext2FS/XIAFS
+ Ext2/Ext3/Ext4 Information [4 bytes]:
  # FS Character Set [4 bytes]: OEM
  * Block Size [4 bytes]: 4096 b (8 sec)
  * First SuperBlock Offset [4 bytes]: 1024 b (2 sec)
  * Blocks Per Volume [4 bytes]: 6144862
  * INodes Per Volume [4 bytes]: 3074176
  * Creator OS [4 bytes]: Linux
  * Major Version [4 bytes]: 1
  * Minor Version [2 bytes]: 0
  * Last Mount Time [8 bytes]: 9.11.2010 14:37:44
  * Last Write Time [8 bytes]: 9.11.2010 15:42:35
  * Last Check Time [8 bytes]: 22.7.2010 17:30:1
  * Volume Size [8 bytes]: 24003 Mb (49158896 sec)

- Drive Number 9 --------------------------------
* Drive Type [256 bytes]: Partition,Logical
* Name [22 bytes]: Partition4
* Size [8 bytes]: 1953 Mb (4000122 sec)
* Partition Offset [8 bytes]: 82 Gb (172024083 sec)
* Partition Size [8 bytes]: 1953 Mb (4000122 sec)
* Partition Type [256 bytes]: Linux (swap)

- Drive Number 10 -------------------------------
* Drive Type [256 bytes]: Partition,Logical
* Name [22 bytes]: Partition5
* Size [8 bytes]: 28521 Mb (58412277 sec)
* Partition Offset [8 bytes]: 83 Gb (176024268 sec)
* Partition Size [8 bytes]: 28521 Mb (58412277 sec)
* Partition Type [256 bytes]: FAT32
+ FAT Information [4 bytes]:
  * FAT Bits (12,16,32) [4 bytes]: 32
  * Cluster Size [4 bytes]: 16384 b (32 sec)
```

```
  * First Cluster Offset [8 bytes]: 14240 Kb (28480 sec)
  * Root Directory Cluster [4 bytes]: 2
  * First FAT Offset [8 bytes]: 18432 b (36 sec)
  * Size of One FAT Table [8 bytes]: 7127 Kb (14254 sec)
  * Number of FAT Copies [4 bytes]: 2
  # Active FAT copy [4 bytes]: Auto
  * Sector Size [4 bytes]: 512 b
  * Major Version [1 bytes]: 0
  * Minor Version [1 bytes]: 0
  * Volume Size [8 bytes]: 28521 Mb (58412277 sec)

- Drive Number 11 --------------------------------
* Drive Type [256 bytes]: Partition,Logical
* Name [22 bytes]: Partition1
* Size [8 bytes]: 1780 Mb (3646628 sec)
* Partition Offset [8 bytes]: 63 Kb (126 sec)
* Partition Size [8 bytes]: 1780 Mb (3646628 sec)
* Partition Type [256 bytes]: NTFS/HPFS
+ NTFS Information [4 bytes]:
  * Cluster Size [4 bytes]: 2048 b (4 sec)
  * MFT Record Size [4 bytes]: 1024 b
  * MFT Position [8 bytes]: 12288 b (24 sec)
  * MFT Mirror Position [8 bytes]: 302 Kb (604 sec)
  * Index Block Size [4 bytes]: 4096 b
  * Sector Size [4 bytes]: 512 b
  * Volume Size [8 bytes]: 1780 Mb (3646624 sec)

- Drive Number 12 --------------------------------
* Drive Type [256 bytes]: Partition,Logical
* Name [22 bytes]: Partition2
* Size [8 bytes]: 1270 Mb (2602466 sec)
* Partition Offset [8 bytes]: 1780 Mb (3646818 sec)
* Partition Size [8 bytes]: 1270 Mb (2602466 sec)
* Partition Type [256 bytes]: FAT32
+ FAT Information [4 bytes]:
  * FAT Bits (12,16,32) [4 bytes]: 32
  * Cluster Size [4 bytes]: 4096 b (8 sec)
  * First Cluster Offset [8 bytes]: 2548 Kb (5096 sec)
  * Root Directory Cluster [4 bytes]: 2
  * First FAT Offset [8 bytes]: 19456 b (38 sec)
  * Size of One FAT Table [8 bytes]: 1268 Kb (2537 sec)
  * Number of FAT Copies [4 bytes]: 2
  # Active FAT copy [4 bytes]: Auto
  * Sector Size [4 bytes]: 512 b
  * Major Version [1 bytes]: 0
  * Minor Version [1 bytes]: 0
  * Volume Size [8 bytes]: 1270 Mb (2602466 sec)

- Drive Number 13 --------------------------------
* Drive Type [256 bytes]: Partition,Logical
* Name [22 bytes]: Partition3
* Size [8 bytes]: 1796 Mb (3678821 sec)
* Partition Offset [8 bytes]: 3051 Mb (6249348 sec)
```

```
* Partition Size [8 bytes]: 1796 Mb (3678821 sec)
* Partition Type [256 bytes]: FAT16 (big)
+ FAT Information [4 bytes]:
  * FAT Bits (12,16,32) [4 bytes]: 16
  * Cluster Size [4 bytes]: 32 Kb (64 sec)
  * First Cluster Offset [8 bytes]: 178 Kb (356 sec)
  * Root Directory Offset [8 bytes]: 231424
  * Root Directory Length [4 bytes]: 16384 b
  * First FAT Offset [8 bytes]: 1024 b (2 sec)
  * Size of One FAT Table [8 bytes]: 112 Kb (225 sec)
  * Number of FAT Copies [4 bytes]: 2
  # Active FAT copy [4 bytes]: Auto
  * Sector Size [4 bytes]: 512 b
  * Major Version [1 bytes]: 0
  * Minor Version [1 bytes]: 0
  * Volume Size [8 bytes]: 1796 Mb (3678821 sec)

- Drive Number 14 --------------------------------
* Drive Type [256 bytes]: Partition,Primary
* Name [22 bytes]: Partition4
* Size [8 bytes]: 65 Gb (136440046 sec)
* Partition Offset [8 bytes]: 9695 Mb (19856339 sec)
* Partition Size [8 bytes]: 65 Gb (136440046 sec)
* Partition Type [256 bytes]: NTFS/HPFS
+ NTFS Information [4 bytes]:
  * Cluster Size [4 bytes]: 4096 b (8 sec)
  * MFT Record Size [4 bytes]: 1024 b
  * MFT Position [8 bytes]: 3072 Mb (6291456 sec)
  * MFT Mirror Position [8 bytes]: 32 Gb (68220016 sec)
  * Index Block Size [4 bytes]: 4096 b
  * Sector Size [4 bytes]: 512 b
  * Volume Size [8 bytes]: 65 Gb (136440045 sec)

- Drive Number 15 --------------------------------
* Drive Type [256 bytes]: Empty Space
* Name [28 bytes]: Empty Space15
* Size [8 bytes]: 4847 Mb (9928170 sec)
* Partition Offset [8 bytes]: 4847 Mb (9928169 sec)
* Partition Size [8 bytes]: 4847 Mb (9928170 sec)

- Drive Number 16 --------------------------------
* Drive Type [256 bytes]: Partition,Primary
* Name [22 bytes]: Partition1
* Size [8 bytes]: 402 Gb (844298009 sec)
* Partition Offset [8 bytes]: 32256 b (63 sec)
* Partition Size [8 bytes]: 402 Gb (844298009 sec)
* Partition Type [256 bytes]: NTFS/HPFS
+ NTFS Information [4 bytes]:
  * Cluster Size [4 bytes]: 4096 b (8 sec)
  * MFT Record Size [4 bytes]: 1024 b
  * MFT Position [8 bytes]: 3072 Mb (6291456 sec)
  * MFT Mirror Position [8 bytes]: 298 Gb (625129280 sec)
  * Index Block Size [4 bytes]: 4096 b
```

```
  * Sector Size [4 bytes]: 512 b
  * Volume Size [8 bytes]: 402 Gb (844298000 sec)

- Drive Number 17 -------------------------------
* Drive Type [256 bytes]: Partition,Logical
* Name [22 bytes]: Partition2
* Mount Points [4 bytes]: /
* Size [8 bytes]: 190 Gb (400005120 sec)
* Partition Offset [8 bytes]: 402 Gb (844298240 sec)
* Partition Size [8 bytes]: 190 Gb (400005120 sec)
* Partition Type [256 bytes]: Ext2FS/XIAFS
+ Ext2/Ext3/Ext4 Information [4 bytes]:
  # FS Character Set [4 bytes]: OEM
  * Block Size [4 bytes]: 4096 b (8 sec)
  * First SuperBlock Offset [4 bytes]: 1024 b (2 sec)
  * Blocks Per Volume [4 bytes]: 50000640
  * INodes Per Volume [4 bytes]: 12500992
  * Creator OS [4 bytes]: Linux
  * Major Version [4 bytes]: 1
  * Minor Version [2 bytes]: 0
  * Last Mount Time [8 bytes]: 11.11.2010 12:43:33
  * Last Write Time [8 bytes]: 29.9.2010 11:18:58
  * Last Check Time [8 bytes]: 29.9.2010 11:18:58
  * Volume Size [8 bytes]: 190 Gb (400005120 sec)

- Drive Number 18 -------------------------------
* Drive Type [256 bytes]: Partition,Logical
* Name [22 bytes]: Partition3
* Size [8 bytes]: 2909 Mb (5957632 sec)
* Partition Offset [8 bytes]: 593 Gb (1244305408 sec)
* Partition Size [8 bytes]: 2909 Mb (5957632 sec)
* Partition Type [256 bytes]: Linux (swap)

- Drive Number 19 -------------------------------
* Drive Type [256 bytes]: Empty Space
* Name [28 bytes]: Empty Space19
* Size [8 bytes]: 992 Kb (1985 sec)
* Partition Offset [8 bytes]: 593 Gb (1244303360 sec)
* Partition Size [8 bytes]: 992 Kb (1985 sec)

********************************************************************************
***************

------------------------------------------- Session 1
-------------------------------------------
START Date / Time of Collection: 2010-11-11 16:14:10

Source drive:Sector     Modification Date       MD5
      File Name
 12:      216176        2003-11-17 02:13:14     3743dc1fef09606b97f2f8af77f0c2fa
      Files to Recover/Wipe Test 1.doc
 12:      216320        2003-11-17 02:13:34     70d5bf4c1630cc2d65ffa7f171842c2b
      Files to Recover/Wipe Test 4.doc
```

```
12:      216368        2003-11-17 02:14:04     929fcf3b344b8fd1fee4af24388b622e
     Files to Recover/Wipe Test 5.doc
12:       83080        2005-07-07 01:24:18     e9f5ca4cad1cea3d5202a74fc69224c0
     Files to Recover/~$pe Test 2.doc
12:       83168        2006-05-13 23:39:16     9c6338caa791315f2aadf9a55aab07bb
     Files to Recover/Outlook_recovered_by_R_Mail.pst
12:       83608        2006-05-14 21:15:32     85af76d9f2e3d5ca4028a8872a0ff12a
     Files to Recover/Outlook.pst
12:     1059648        2007-04-23 17:15:22     4ef0427f18de06755aeb1cc0a9c65e84
     Files to Recover/Picture 149.jpg
12:     1062928        2007-04-23 17:20:16     ffd0944df55bc375bda69def5f1d1f5e
     Files to Recover/Picture 237.jpg

END Date / Time of Collection: 2010-11-11 16:14:10
--------------------------------------------------------------------------------
---------------
```

4.9 R-Studio Command Line Command and Switches

You may start **R-Studio** from the terminal using the following command:

For **R-Studio**: `rstudio`.

For **R-Studio Technician**: `rstudio-tech`.

Note: You need to elevate your privilegies if you're not the root to start **R-Studio**.

If there are problems in starting **R-Studio** and while working with it, you may use switches to avoid them.

The following switches are available:

`-all_drives`	Forces **R-Studio** to show all logical disks in the system. Normally **R-Studio** shows only local disks in the system. Some storage devices may pretend that they are not local disks.
`-debug`	Includes additional debug information. When this switch is used, an additional command **Create FS Snapshot** on the context menu appears for an object with a file system. An FS Snapshot contains system data for the file system only (file descriptions without file contents). If a problem appears, this snapshot can be sent to **R-Studio** technical support to identify the problem. This switch greatly slows **R-Studio**. You may also turn this mode on by selecting **Debug Mode** on the Settings dialog box.
`-flush`	Flushes the log file after each write to log operations. This switch is helpful when **R-Studio** locks and its log file remains in memory cache unwritten to a disk. This switch greatly slows **R-Studio**.
`-log <filename>`	Started with this switch, **R-Studio** writes its log into the specified file. If **R-Studio** locks and its log file remains in memory cache unwritten to a disk, use the `-flush` switch.
`-mem <size in MB>`	Sets memory usage limit in MB for **R-Studio** to reconstruct the file tree. When it exceeds the limit, a `Too many files...` message appears. You may temporally stop file listing and browse through found files. Then you can resume file listing. You also may skip this file section and continue file listing. Example: `-mem 400` - sets the limit to 400 MB.
`-no_ide_ext`	Turns off the inquiry about extended information on HDDs in Wind9x/ME. This

	switch may be helpful if **R-Studio** returns information about HDDs incorrectly (detects HDD geometry incorrectly).
`-no_int13`	Turns off the disc access through Int13 in Wind9x/ME. This switch may be helpful if the system operates incorrectly (detects HDD geometry incorrectly or lock the system).
`-no_ios`	Turns off the Wind9x/ME protected-mode I/O system. This switch may be helpful if this system operates incorrectly (detects HDD geometry incorrectly or lock the system).
`-reset`	**R-Studio** resets an HDD controller each time it reads a bad sector. This switch may be helpful if the controller locks after it attempts to read a bad sector, or returns incorrect data.
`-safe`	Disables automatic partition search on a hard drive, file system recognition on partitions, and other potentially problematic operations. In this mode, it is necessary to use **Find partition** command from the hard drive context menu to manually find a partition.

If an unrecognized problem appears, start **R-Studio** with the `-debug` and `-log <filename>` switches, and send the log and screenshot of the **R-Studio** main panel to the **R-Studio** technical support:

R-Studio Technical Support Team is available 24 hours a day, seven days a week, and has an average response time less than 4 hours.

4.10 Properties Tab

Object size units

You may select the units in which the information on object sizes will be displayed. Some parameters can be edited when the Debug mode is turned on on the Main dialog box of the **R-Studio** settings.

To select the units

1 **Select Properties on the View menu**

2 **Select the units in which you want to see object sizes.**

You may select

Show as Bytes
Show as Sectors
Show as Bytes and Sectors

1.Basic information

This section shows basic information for a disk object.

More information...

Drive Type	Device/disk type and subtype. Current **R-Studio** version supports the following types: Disk, WORM, CDROM, Optical, Changer, Floppy, RAM Disk, LDM Partition, LDM Component, LDM Volume and subtypes: Device, OS File, Physical Drive, Mount Point, Partition, Volume Set, Mirror, Stripe Set, RAID 4, RAID 5, RAID 6
Name	Device/disk name
Size	Device/disk size
Bus Type	Device/disk bus type. Can be:

	IDE/ATA, IDE/ATAPI, SCSI, Floppy, USB, 1394, SSA, FibreChannel, RAID, SMART, ABIOS

2.Information on hard drives and logical disks

This section shows available information on hard drives and logical disks. These properties depend on the drive/disk type and appear only when applicable. Under Windows NT/2000/XP/2003/Vista/2008/7, an IDE drive/disk may be represented as a SCSI device, that is why the SCSI Address section appears under these OSes for those drives/disks.

More information...

OS object	Appears for image files under Windows 9x/ME and NT/2000/XP/2003/Vista/2008/7, for drives/disks under Windows NT/2000/XP/2003/Vista/2008/7 only. An object name used by OS to access the device/disk.
R-Studio driver	Driver names (both internal and OS) used to access this drive/disk.
Sector Size	Drive/disk sector size
Physical Drive Geometry	This section shows physical geometry for a hard drive. For a logical disk it shows the physical geometry for a hard drive where the logical disk resides
Cylinders	
Tracks Per Cylinder	
Sectors Per Track	
Sector Size	
Device Identification	This section shows vendor information for the drive/disk
Vendor	
Product	
Firmware	
Bus	
SCSI Address	This section shows SCSI information for the drive/disk
Port Number	
Path ID	
Target ID	
Lun	
Windows 9x/ME adds the following properties:	
Int13 Drive Number	128 for the first hard drive accessible through Int13, 129 for the second one, etc. 0...128 for drives and other devices accessible through a Windows 9x/ME protected mode driver, if their Int13 device option is disabled. **R-Studio** can use Int13 disk access, and for some drive types, like SCSI devices, Int13 access is preferable. You may consider enabling the Int13 device option in the Windows Device Manager for such devices.
Int13 Extension Version	Int13 Extension Version Support for hard drives. Extended Int13 support is necessary for large drives. If this property is zero, Extended Int13 is not supported, otherwise, it shows Extended Int13 standard version, the large, the better.

3.Properties controlling access to hard drives and logical disks

This section shows properties that control access (read and write) to hard drives and logical disks. They are set

to their optimal values and should be altered only if access problems appear.

More information...

Drive Control	
Maximum transfer	Maximum data size that can be read or written during a single access to the drive. If there are problems with drive access, decrease the value of this property
I/O Unit	Data size read or written during a single access to the drive is a multiple value of this property. If there are problems with drive access, decrease the value of this property
Buffer Alignment	Drive data transfer buffer is positioned at an address multiple value of this property. If there are problems with drive access, increase the value of this property.
These three properties are set by OS drivers. If the drivers set incorrect values, problems may appear during data transfer operations. You can alter them until data transfer becomes stable.	
I/O Tries	Number of read/write tries during access to the drive. If there are bad sectors on the drive, increase the value of this property. This may help to successfully read those sectors. Sometimes, if the I/O Tries parameter is set too large and there are some unreadable sectors on the hard drive, the hard drive-controller pair may refuse to perform any successive read/write operations with the entire hard drive when it fails to read/write such sectors. In this case, set this parameter to zero. The default value is specified on the Settings (Bad Sectors) panel. **R-Studio** treats bad sectors in the following way: It reads a certain part of disk (predefined by Windows) and • If Default read attempts is set to 0, the entire part with bad sectors will be filled with the specified pattern. • If Default read attempts is set to a non-zero value, **R-Studio** reads again that part sector by sector, repeating the attempts the specified number of times. If **R-Studio** still cannot read a bad sector, it fills the sectors with the specified pattern. In this case only the bad sectors will be filled with the pattern, but that extremely slows the disk read process. For example, if you set Default read attempts to 1, a bad sector will be read 2 times.

4.Partition properties

A *partition* is a continuous area on a hard drive, characterized by its offset and size. There are partitions on basic disks, dynamic disks, and recognized volumes and partitions. **R-Studio** treats regions like partitions.

More information...

Partition Offset	Initial offset for the partition.
Partition Size	Size of the partition.
Partition Type	File system type for the partition. If the record in the drive partition table is incorrect, this property may differ from the actual file system type for this partition. Still, **R-Studio** will process this partition correctly, as it does not use this property.
Partition number	Appears under Windows NT/2000/XP/2003/Vista/2008/7 only. Shows the number of the partition on the physical drive.
For regions and recognized partitions, Partition Offset and Partition Type properties can be manually corrected.	

5.Compound volume properties

A *compound volume* is a union of several partitions or other disk objects. Each union type has its own rules, unique for each compound volume type. Among compound volumes are: *Volume Sets* (RAIDs Level 0), *Mirrors* (RAIDs Level 1), *RAIDs4/5/6* (RAIDs Level 4/5/6), both physical and created by the user (*Virtual Volume Sets*, *Virtual Stripe Sets*, *Virtual Mirrors*, *Virtual RAID5*).

More information...

Main properties of compound volumes are *parents* (disk objects from which a compound volume is created) and their order. These properties may be viewed in the Parents tab. For user-created compound volumes these properties may be altered.	
Raid Block Size	Data block size for compound volumes of RAID (Level 0-5) types

6.LDM disks and volumes (Dynamic Disks)

LDM disks and volumes are volumes controlled by Logical Disk Manager (LDM). They are represented on a hard drive as a LDM database rather than partition tables. Under Windows 2000/XP/2003/Vista/2008/7, LDM disks are also called *Dynamic Disks*.

More information...

Offset of Logical Disk	Initial offset of a logical disk on a hard drive. For disks, initially formatted by LDM, this value is often **31.5KB**, for converted disks, it may be larger.
Supposed Parents Count	Supposed number of parent partitions for compound LDM volumes. If the LDM database is not damaged, the value of this property must be equal to the number of parent objects in the Parents tab for the disk object.
LDM Host GUID	Global Unique Identifier of a computer system where this LDM disk group has been created.
LDM DiskGroup GUID	Global Unique Identifier of the LDM disk group.
LDM Disk GUID	Global Unique Identifier of the hard drive.
LDM Volume GUID	Global Unique Identifier of the volume.
LDM Disk ID	Local hard drive Identifier, unique within this LDM disk group.
LDM Partition ID	Local partition Identifier, unique within this LDM disk group.
LDM Component ID	Local component Identifier, unique within this LDM disk group.
LDM Volume ID	Local volume Identifier, unique within this LDM disk group.
LDM Disk AltName	Additional Alternative Name given by LDM to the hard drive.
LDM Disk DriveHint	Last name of the volume, under which is has been mounted in the system. May be either a letter (C:, D:, etc.), or a mount point under Windows 2000/XP/2003/ Vista/2008/7.

7.File System Volume properties

A *File System (FS) volume* is a disk object where a certain, supported by **R-Studio**, file system is present. There are two FS volume types: FS volume on a regular disk object and a recognized volume, found by a scan process. FS volume properties depend on volume's file system and type.

7.1.NTFS Volume properties

These properties are present for all NTFS volumes and represent their main properties. For *recognized volumes*, these values can be altered.

More information...

NTFS Information	Regular volumes
Recognized NTFS	Recognized volumes
Cluster Size	Cluster size for the NTFS volume.
MFT record size	Size of one MFT record describing one file on the NTFS volume. This is an important property of any NTFS volume. Its common value is 1KB. If this property has incorrect value, many files may be incorrectly recovered.
Sector Size	Sector size for the physical drive. This property is read from the boot sector of the NTFS volume and does not affect **R-Studio** operation.
Index Block Size	Index block size for the NTFS volume. This property determines binary trees used to store NTFS folder structure. It does not affect **R-Studio** operation.
MFT position	MFT offset from the start of the NTFS volume.
MFT Mirror Position	Second MFT copy offset from the start of the NTFS volume.
Volume size	Size of the NTFS volume. This property does not affect **R-Studio** operation.

7.2.FAT Volume properties

These properties are present for all FAT volumes and represent their main properties. For *recognized volumes*, these values can be altered.

More information...

FAT Information	Regular volumes
Recognized FAT	Recognized volumes
FAT Bits (12,16,32)	FAT type. 12 for the FAT12, 16 for the FAT16, 32 for the FAT32.
Cluster Size	Cluster size for the FAT volume.
First Cluster Offset	Offset of the first cluster from the start of the FAT volume.
Boot Directory Cluster	(*For FAT32 only.*) Cluster number where the root directory starts on the FAT volume where the logical disk resides.
Root Directory Offset	(*For FAT12 and 16 only.*) Root directory offset from the start of the FAT volume.
Root Directory Length	(*For FAT12 and 16 only.*) Root directory length for the FAT volume.
First FAT Offset	Offset for the first FAT table on the volume. Together with the Size of One Fat Table property, is a most important property for a FAT volume. If this property is incorrect, many files (especially fragmented ones) may be incorrectly recovered.
Size of One FAT Table	Size of one FAT table on the volume.
Sector Size	Sector size of the hard drive. This property is read from the boot sector of the FAT volume and does not affect **R-Studio** operation.
Number of FAT Copies	Number of FAT copies on the FAT volume.
Active FAT copy	Active FAT table number for the FAT volume. Can be set to Disabled, Auto, 1, or 2. If it is Disabled, **R-Studio** processes the volume as there is no FAT table present. This may be useful if the volume has been reformatted and thus a new FAT table is created and the old one is deleted. In this case, it is reasonable to recover files from the previous volume without processing the new and irrelevant FAT table. All files will be

	recovered as continuous byte chains beginning from their start cluster. Unfragmented files will be recovered successfully. If it is 1 or 2, **R-Studio** uses the first or second FAT table copy, respectively. If it is Auto, **R-Studio** uses both FAT table copies and decides, which FAT table copy should be used for a particular FAT table sector. This may be useful when both FAT tables are partially damaged.
Major version	FAT version.
Minor version	FAT minor version.
Volume size	Size of the volume.

7.3.Ext2FS Volume properties

These properties are present for all Ext2FS volumes and represent their main properties. For *recognized volumes*, these values can be altered.

More information...

Ext2FS Information	Regular volumes
Recognized Ext2FS	Recognized volumes
Block Size	Block size of Ext2FS file system. A block in the Ext2FS file system is similar to a cluster in the FAT file system.
First SuperBlock Offset	Offset of the first SuperBlock from the start of the Ext2FS volume.
Blocks Per Volume	Number of blocks in the Ext2FS volume.
INodes Per Volume	Number of inodes on the Ext2FS volume. An inode is a record describing file's size, attributes, position on an Ext2FS volume - all information about a file, except its name, which is stored separately. Therefore, the INodes Per Volume parameter is equal to the maximum number of files on an Ext2FS volume.
Creator OS	The OS that created this Ext2FS volume. May be Linux, Hurd, Masix, FreeBSD, Lites.
Major version	Ext2FS version. Usually 1.
Minor version	Ext2FS minor version. Usually 0.
Last Mount Time	Last mount time for this Ext2FS volume.
Last Write Time	Last write time for this Ext2FS volume.
Last Check Time	Last check time for this Ext2FS volume.
Volume size	Size of the volume.

7.4.Recognized Volume properties

These properties are present for all *recognized volumes*, regardless of their file system type. They estimate how reliable those volumes are recognized. This is useful for fast search for, and selection of, optimally recognized volume to recover.

More information...

Parsed File Entries	Number of files proving that this recognized volume existed. May have any non-negative values. The main property characterizing the reliability of volume recognition. The larger it, the higher probability that this recognized volume has file system properties that have been correctly found.
Parsed Boot Records	Number of boot records proving that this recognized volume existed. May be 0 or 1. This is the second important property characterizing the reliability of volume recognition.

Estimated Size	Estimated size of the recognized FS partition/volume. This property shows the most probable size of the recognized FS partition/volume. Alternatively, Size and Partition Size are set to the highest possible values in order to recover the maximum number of files.

V Working with the Third-Party Hardware

The Technician version of **R-Studio** can work together with third-party hardware developed for in-depth data recovery. Currently, the following devices are supported:

- **DeepSpar Disk Imager™**

5.1 DeepSpar Disk Imager™

Currently only the Windows version of **R-Studio** can work with **DeepSpar Disk Imager™** directly. **R-Studio** versions for Mac and Linux can load and process its images.

DeepSpar Disk Imager™ (**DDI**) is an HDD imaging device specifically built for data recovery from hard drives with hardware issues. It greatly increases imaging speed, accuracy, and integrity of data retrieved from such drives.

The main features that **DDI** provides when working with hard drives are the following:

- Direct low-level access to a hard drive bypassing the computers BIOS.
- Disabling specific drive read/write heads.
- Disable SMART subsystem, Bad Sector Reallocation, and Read Look-Ahead
- Read sector timeout controlled by Software/Hardware/PHY drive reset commands
- Bit level analysis of corrupted data to filter out the read-write channel noise
- Fully customizable multi-pass imaging

And many more others an advanced disk imager must have. You may learn more about **DDI** on its vendor site: **DeepSpar Disk Imager™**.

Viewing the drive map

A drive map shows the conditions for individual disk sectors. You may see which sectors are OK, bad, or unstable.

To view the drive map,

* **Right-click the required hard drive/partition and select Show drive map... on the shortcut menu,**

> **The drive map will appear in the right tab.**

Drive map controls

Sectors	The number of the first sector in the row.
Offset	Offset in the data. Enter the address you want to jump to and press the **Enter** key.
Sectors/Bytes/KB...	Specifies the dimension of the data in the **Offset** field.
Previous/Next	Moves to the previous/next part of the data.
+/-	Zooms into/out of, the data.

To see more detailed information about a particular sector range, right click the corresponding rectangle and select **Information** on the shortcut menu.

Click the **Open in Hex Editor** button to open the selected block in the **Text/hexadecimal editor**.

Viewing the file map

A file map shows the conditions for individual file sectors. You may see which sectors are OK, bad, or unstable.

To view the file map,

* **Right-click the required file and select Map of file... on the shortcut menu,**

> **The file map will appear in the lower pane.**

Drive map controls

Sectors	The number of the first sector in the row.
Offset	Offset in the data. Enter the address you want to jump to and press the **Enter** key.
Sectors/Bytes/KB...	Specifies the dimension of the data in the **Offset** field.
Previous/Next	Moves to the previous/next part of the data.
+/-	Zooms into/out of, the data.

To see more detailed information about a particular sector range, right click the corresponding rectangle and select **Information** on the shortcut menu.

Click the **Open in Hex Editor** button to open the selected block in the **Text/hexadecimal editor**.

VI R-Studio Emergency

R-Studio Emergency is a tool that allows you to startup a computer with a damaged startup disk and recover data stored on its hard drives. Then restored data can either be saved on its disk or transferred to a working computer via a network.

The R-Studio Emergency version is a part of the R-Studio software package.

You may run this R-Studio Emergency version on a computer for which you have bought an R-Studio license, and you may not transfer the licensed software to another computer.

R-Studio Emergency
- **Contact Information and Technical Support**
- **Installing R-Studio Emergency Startup Media Creator**
- **Creating Startup Disks**

R-Studio Emergency Operation
- **Starting a Computer with the R-Studio Emergency Startup Disks**
- **File Recovery**
- **Searching for a File**
- **Disk Scan**
- **Disk Images**

Technical Information
- **Network Drives**
- **Properties and Text/Hexadecimal Viewer**
- **Log**

Hardware Compatibility List

6.1 Contact Informaiton and Technical Support

To obtain the latest version of **R-Studio Emergency**, go to:

Product Site: http://www.r-tt.com
Sales Department: sales@r-tt.com

R-Studio Technical Support Team is available 24 hours a day, seven days a week, and has an average response time less than 4 hours.

Tech. Support: support@r-tt.com
Send your support request to: http://www.r-tt.com/Support_request.html

6.2 Installing R-Studio Emergency Startup Media Creator

Attention Windows NT/2000/XP/2003/Vista/2008/7 users! You must have administrative privileges to install R-Studio Emergency Startup Media Creator.

If you are not sure whether you have such privileges, you almost certainly do not have them. Contact your system administrator for assistance.

1. Run the setup file.
2. Follow the on-screen instructions.

You may create startup disks even before the installation ends.

6.3 Creating Startup Disks

You need to create either

- A startup CD/DVD disc. You may create an ISO image, or write the disc directly from **R-Studio** Emergency Startup Media Creator, if there is a CD/DVD recorder in your system.

  or

- A startup FAT/FAT32 removable device recognized by your system as a bootable one. The total available size of the device should be more than 50 MB.

  or

- 5 floppy disks.

Check the Hardware Compatibility List.

If you have problems with starting you computer up from the **R-Studio** Emergency startup disks, select **Configure startup media troubleshooting options** on the Startup media type selection dialog box. Then the Startup Media Troubleshooting Options dialog box will appear. You may configure these options to eliminate those problems.

When **R-Studio Emergency Startup Media Creator** starts, its Welcome dialog box appears:

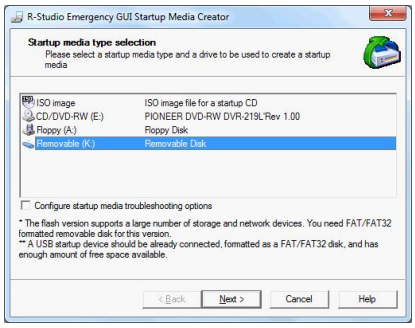
Welcome to **R-Studio** Emergency Startup Media Creator **dialog box**

Welcome **dialog box**

R-Studio Emergency GUI Startup Media Creator
Welcome to R-Studio Emergency GUI Startup Media Creator
This program creates R-Studio Emergency GUI 5.3 Build 490 startup media. Using these media, you will be able to startup a computer with a damaged startup disk and recover data stored on its hard drives.
Click Next to continue, or Cancel to exit.
< Back
Next >
Cancel
Help

click the **Next** button to see the list of all devices on which startup disks may be created.

Startup media type selection **dialog box**


R-Studio Emergency GUI Startup Media Creator
Startup media type selection
Please select a startup media type and a drive to be used to create a startup media
ISO image
ISO image file for a startup CD
CD/DVD-RW (E:)
PIONEER DVD-RW DVR-219L Rev 1.00
Floppy (A:)
Floppy Disk
Removable (K:)
Removable Disk
Configure startup media troubleshooting options
* The flash version supports a large number of storage and network devices. You need FAT/FAT32 formatted removable disk for this version.
** A USB startup device should be already connected, formatted as a FAT/FAT32 disk, and has enough amount of free space available.
< Back
Next >
Cancel
Help

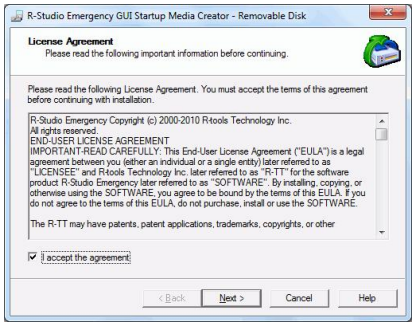
To create a startup CD/DVD disc directly on your CD/DVD writer (if present):

1 **Run R-Studio Emergency**

2 **Select the CD/DVD writer on the** Startup media type selection **dialog box and click the Next button**

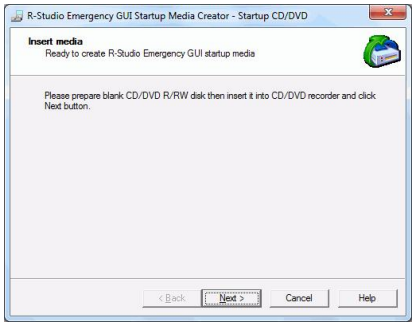
3 **Read and accept the License Agreement and enter the registration key on the R-Studio** Emergency Activation **dialog box and click the Next button**

R-Studio Emergency Activation **dialog box**


R-Studio Emergency GUI Startup Media Creator - Removable Disk
License Agreement
Please read the following important information before continuing.
Please read the following License Agreement. You must accept the terms of this agreement before continuing with installation.
R-Studio Emergency Copyright (c) 2000-2010 R-tools Technology Inc.
All rights reserved.
END-USER LICENSE AGREEMENT
IMPORTANT-READ CAREFULLY: This End-User License Agreement ("EULA") is a legal agreement between you (either an individual or a single entity) later referred to as "LICENSEE" and R-tools Technology Inc. later referred to as "R-TT" for the software product R-Studio Emergency later referred to as "SOFTWARE". By installing, copying, or otherwise using the SOFTWARE, you agree to be bound by the terms of this EULA. If you do not agree to the terms of this EULA, do not purchase, install or use the SOFTWARE.
The R-TT may have patents, patent applications, trademarks, copyrights, or other
I accept the agreement
< Back
Next >
Cancel
Help

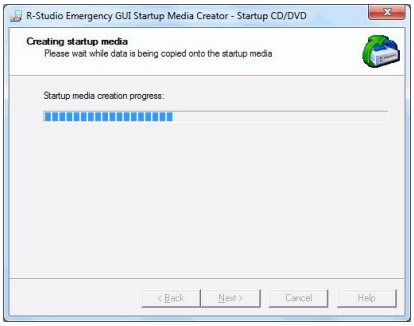
4 **Insert a blank CD/DVD disk into the CD/DVD recorder and click the Next button**

Insert a CD/DVD disc **dialog box**


R-Studio Emergency GUI Startup Media Creator - Startup CD/DVD
Insert media
Ready to create R-Studio Emergency GUI startup media
Please prepare blank CD/DVD R/RW disk then insert it into CD/DVD recorder and click Next button.
< Back
Next >
Cancel
Help

> **R-Studio Emergency Startup Media Creator will start creating the startup CD/DVD disc showing the progress on the** Creating startup media **dialog box**

Creating startup media **dialog box**


R-Studio Emergency GUI Startup Media Creator - Startup CD/DVD
Creating startup media
Please wait while data is being copied onto the startup media
Startup media creation progress:
< Back
Next >
Cancel
Help

When R-Studio Emergency Startup Media Creator finishes creating the startup CD/DVD disc, the R-Studio Emergency Startup Media Creation is Finished **message will appear**

You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Back** button.

R-Studio Emergency Startup Media Creation is Finished **message**

R-Studio Emergency GUI Startup Media Creator - Startup CD/DVD
R-Studio Emergency GUI Startup Media Creator Startup Media Creation is Finished
The startup CD/DVD has been created successfully.
Click Back to create other media or Finish to exit.
< Back
Finish
Help

To create an ISO image of a startup CD/DVD disc

1 **Run R-Studio Emergency**

2 **Select ISO Image for a startup CD/DVD on the R-Studio** Emergency Startup Media Creator **dialog box and click the Next button**

3 **Read and accept the License Agreement and enter the registration key on the R-Studio** Emergency Activation **dialog box and click the Next button**

4 **Select a place and file name for the ISO image of the startup CD/DVD and click the Save button**

> **When R-Studio Emergency Startup Media Creator finishes writing the file with the ISO image, the R-Studio** Emergency Startup Media Creation is Finished **message will appear**

You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Next** button.

R-Studio Emergency Startup Media Creation is Finished **dialog box**

R-Studio Emergency GUI Startup Media Creator - ISO image file for a startup CD
R-Studio Emergency GUI Startup Media Creator Startup Media Creation is Finished
The startup ISO image has been created successfully. Now you may write a startup CD using your favorite CD writing software.
Click Back to create other media or Finish to exit.
< Back
Finish
Help

5 Create the startup CD/DVD using your favorite CD/DVD creation software

Load the created ISO image into the CD/DVD creation software. Consult documentation for the software for details.

To create a startup FAT/FAT32 removable device

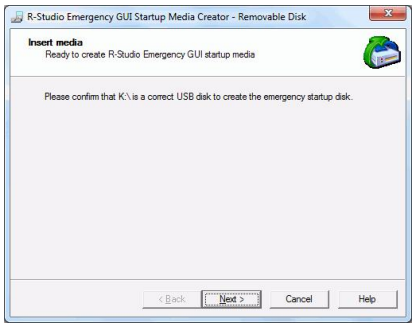
1 Run R-Studio Emergency

2 Select the removable device on the Startup media type selection **dialog box and click the Next button**

3 Read and accept the License Agreement and enter the registration key on the R-Studio Emergency Activation **dialog box and click the Next button**

4 Check that the FAT/FAT32-formatted device is ready and click the Next button

Ready to create startup media **dialog box**


R-Studio Emergency GUI Startup Media Creator - Removable Disk
Insert media
Ready to create R-Studio Emergency GUI startup media
Please confirm that K:\ is a correct USB disk to create the emergency startup disk.
< Back
Next >
Cancel
Help

> R-Studio Emergency Startup Media Creator will start creating the startup USB disk showing the progress on the Creating startup media **dialog box**

When R-Studio Emergency Startup Media Creator finishes creating the startup device, the R-Studio Emergency Startup Media Creation is Finished **message will appear**

You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Next** button.

R-Studio Emergency Startup Media Creation is Finished **dialog box**

R-Studio Emergency GUI Startup Media Creator - Removable Disk
R-Studio Emergency GUI Startup Media Creator Startup Media Creation is Finished
The startup removable disk has been created successfully.
Click Back to create other media or Finish to exit.
< Back
Finish
Help

To create floppy disks:

You will need 5 floppy disks.

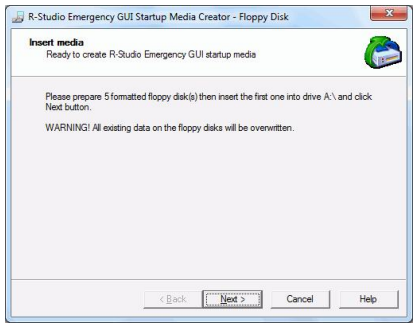
1 **Run R-Studio Emergency**

2 **Select Floppy Disk for the startup floppy disks on the R-Studio** Emergency Startup Media Creator **dialog box and click the Next button**

3 **Read and accept the License Agreement and enter the registration key on the R-Studio** Emergency Activation **dialog box and click the Next button**

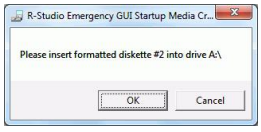
4 **Insert the first floppy disk and click the Next button on the** Ready to create startup media **dialog box**

R-Studio Emergency Startup Media Creation- Floppy Disk **message**


R-Studio Emergency GUI Startup Media Creator - Floppy Disk
Insert media
Ready to create R-Studio Emergency GUI startup media
Please prepare 5 formatted floppy disk(s) then insert the first one into drive A:\ and click Next button.
WARNING! All existing data on the floppy disks will be overwritten.
< Back
Next >
Cancel
Help

> **R-Studio Emergency Startup Media Creator will start creating the first startup floppy disk showing the progress on the** Creating startup media **dialog box**

5 **Insert the second floppy disk and click the OK button when the** Please insert formatted diskette #2 into drive A: **message will appear**



> **When R-Studio Emergency Startup Media Creator finishes creating the second startup floppy disk, the R-Studio** Emergency Startup Media Creation is Finished **message will appear**

You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Next** button.

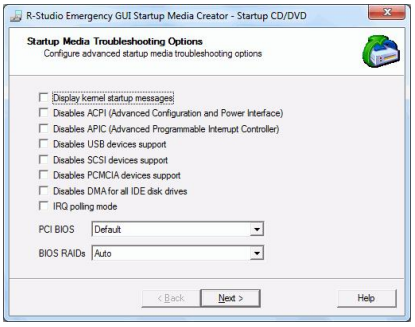
R-Studio Emergency Startup Media Creation is Finished **message**

R-Studio Emergency GUI Startup Media Creator - Floppy Disk
R-Studio Emergency GUI Startup Media Creator Startup Media Creation is Finished
The startup floppy disk(s) have been created successfully.
Click Back to create other media or Finish to exit.
< Back
Finish
Help

Startup Media Troubleshooting Options

Those options will help you if you have problems with starting you computer up from the **R-Studio**startup disks. Please, contact the **R-Studio Technical Support Team** for more information.

R-Studio Startup Media Troubleshooting Options **dialog box**


R-Studio Emergency GUI Startup Media Creator - Startup CD/DVD
Startup Media Troubleshooting Options
Configure advanced startup media troubleshooting options
Display kernel startup messages
Disables ACPI (Advanced Configuration and Power Interface)
Disables APIC (Advanced Programmable Interrupt Controller)
Disables USB devices support
Disables SCSI devices support
Disables PCMCIA devices support
Disables DMA for all IDE disk drives
IRQ polling mode
PCI BIOS
Default
BIOS RAIDs
Auto
< Back
Next >
Help

Display kernel startup messages	if this checkbox is enabled, **R-Studio** Emergency displays all startup messages. That may be useful to locate the source of the problem when your system hangs during **R-Studio** Emergency startup.
Disables ACPI Disables APIC	Select these checkboxes when your system detects some hardware incorrectly during **R-Studio** Emergency startup and displays messages like: `hda: lost interrupt`
Disables USB device support	Select this checkbox if your system experiences problems with USB devices during **R-Studio** Emergency startup.
Disables SCSI device support	Select this checkbox if your system experiences problems with SCSI devices during **R-Studio** Emergency startup.
Disables PCMCIA device support	Select this checkbox if your system experiences problems with PCMCIA devices during **R-Studio** Emergency startup.
Disables DMA for all IDE disk drives	Select this checkbox if your system experiences problems with IDE disks during **R-Studio** Emergency startup.
IRQ polling mode	Select this checkbox to enable the IRQ polling mode to prevent locking the system because a device generates too much interrupts for the system to handle.
PCI BIOS	Select an appropriate option if your system experiences problems with PCI cards.
BIOS RAIDS	Select an appropriate option if your system experiences problems with RAIDs built in the system board.

6.4 R-Studio Emergency Operation

Starting a Computer with the R-Studio Emergency Startup Disks
File Recovery
Searching for a File
Disk Scan
Disk Images

Technical Information
Properties and Text/Hexadecimal Viewer
Network Drives
Log

Hardware Compatibility List

R-Studio Emergency
Contact Information and Technical Support
Installing R-Studio Emergency Startup Media Creator
Creating Startup Disks

6.4.1 Starting a Computer with the R-Studio Emergency Startup Disks

We recommended that you print out this help page and have the hardcopy on hand while you are performing this action.

If there is a non-IDE disk controller in your system, or you plan to use network disks or external hardware devices, first check the Hardware Compatibility List.

If you plan to use any external device, turn it on before starting the system.

If the motherboard in your computer supports the Serial ATA (SATA) devices, but IDE disks are also present, only the SATA devices should be set to the Enhanced Mode in BIOS.

To start the computer with the R-Studio Emergency startup CD/DVD disc or any removable device,

1 **Make sure that the first startup device in the system BIOS is the CD/DVD drive or the removable device**
Disable "Secure boot" in the system BIOS if your computer is certified to run Windows 8. Refer to your system documentation for details.

2 **Insert the R-Studio Emergency startup CD/DVD disc and start your computer**

> **R-StudioEmergency will start and its** Device / Disk **panel will appear**

To start the computer with the R-Studio Emergency startup floppy disks,

1 **Make sure that the first startup device in the system BIOS is A (Floppy)**
Refer to your system documentation for details.

2 **Insert the first startup floppy disk and start your computer**

> **The following text will appear on the screen:**

```
Loading
Uncompressing ... OK, starting the kernel
```

```
VFS: Insert the second boot disk and press ENTER
```

3 **Insert the second disk and press ENTER.**

> **R-Studio Emergency will start and its** Device / Disk **panel will appear**

Secure boot:

It may be impossible to start a Windows 8 certified computer with the R-Studio Emergency startup disk without some additional actions. This happens because any computer should use a so-called "Secure boot" procedure to comply with Windows 8 hardware certification from Microsoft. In brief, this procedure prevents computer from booting into any operating system that isn't digitally signed with an appropriate digital signature. "Secure boot" is claimed to prevent unauthorized modification of the boot sector by bootkits, viruses, trojans, and other malicious software. To the date, only Windows 8, Windows Server 2012, and selected Linux distributions support this feature. As a side effect, it also prevents most LiveCDs, rescue disks (R-Studio and R-Drive Image included), and other OS from running.

Likely enough, the other requirement of Windows 8 hardware certification is to make it possible for the user to disable the Secure boot procedure. Those settings can be done through the system BIOS under the Boot options. Generally, it's enough to enable Legacy support in those options, but sometimes it may require additional actions. Please, refer to your system documentation to learn more about disabling/enabling Secure boot.

When Secure boot is disabled, it should be possible to start the computer with the R-Studio Emergency startup disk.

Please note that you should enable this feature back after using the startup disks because Windows 8 or Server 2012 may not start properly without the Secure boot feature enabled.

6.4.2 File Recovery

To recover files,

1 **Select a partition on the** Device / Disk **panel on which the files to recover reside and press the Enter key**

> **R-Studiowill change its panel showing the disk's folders/files structure**

2 **Select the file to recover on the** Files View **panel. Use the** Tab **key to switch between panes**

3 **Press the F2 key and specify the output folder on the Recover dialog box**

External USB drives with the NTFS file system: **R-Studio Emergency** can save recovered files on such disks if they are properly disconnected in a Windows system using the **Safely Remove Hardware** icon in the system tray or while shutting Windows down.

Searching for a File
Mapping Network Drives
Viewing object properties

6.4.3 Searching for a File

To search for a file,

1 **Select Find on the Tools menu (or press the Alt+F key)**

2 **Specify a file name or mask**

Look at dialog box

Deleted files:	If it is selected, **R-Studio** makes a search among deleted files/folders.
Existing files:	If it is selected, **R-Studio** makes a search among existing files/folders.
Files:	If it is selected, **R-Studio** includes files into a search.

Folders:	If it is selected, **R-Studio** includes folders into a search.

To find the next file corresponding to the specified file mask,

* **Press the Alt+N key**

6.4.4 Disk Scan

To scan an object

1 **Select an object on the** Device / Disk **panel and press the F6 key**

2 **Specify the required parameters on the** Scan **dialog box and press the Enter key**

Scan dialog box

Start:	Sets the start point of the area to be scanned.
Size:	Sets the size of the area to be scanned.
Numbers in these fields can be in bytes or sectors. If no letters are after the numbers, **R-Studio**assumes the numbers in bytes. The following case-ignoring notation is possible:	
b **kb** **mb** **gb** **tb**	Bytes Kilobytes Megabytes Gigabytes Terabytes

> **When an object is scanned, it may be searched for files, and found files may be recovered the same way as for a regular object**

Found objects:

Extra Found Files	Entries of known file types have been found
Recognized1	Records and file entries are found for this partition
Recognized2	Only file entries are found for this partition
Recognized3	Only boot records are found for this partition

To save scan information

1 **Select an object with scan information**

2 **Press the Alt+D key and select Save Scan Information on the Drive menu**

3 **Specify the output folder and file name on the** Save Scan Information **dialog box**

Mapping Network Drives

To open scan information

1 **Select an object to which scan information is to be opened**

2 **Press the Alt+D key and select Open Scan Information on the Drive menu**

3 **Specify the folder and file name with the scan information on the** Open Scan Information **dialog box**

Mapping Network Drives

To delete scan information

1 **Select an object to which scan information is to be deleted**

2 **Press the Alt+D key and select Delete Scan Information on the Drive menu**

6.4.5 Disk Images

To create an image file

1 **Select an object on the** Device / Disk **panel**

2 **Press the Alt+D key and select Create Plain Image File or Create Compressed Image File on the Drive menu**

Plain Image	If this option is selected, **R-Studio** will create a simple exact copy of the object. This image format is compatible with the previous versions of **R-Studio**.
Compressed Image	If this option is selected, **R-Studio** will create an image file compatible with the images created by **R-Drive Image**, but incompatible with the previous versions of **R-Studio**.

3 **Specify the output folder and file name on the** Create Image File **dialog box**

Mapping Network Drives

To load an image file

1 **Press the Alt+D key and select Open Image File on the Drive menu**

2 **Specify the folder and file name with the image on the** Open Image File **dialog box**

Mapping Network Drives

6.5 R-Studio Emergency Technical Information

Network Drives
Properties and Text/Hexadecimal Viewer
Log

R-Studio Emergency
Contact Information and Technical Support
Installing R-Studio Emergency Startup Media Creator
Creating Startup Disks

R-Studio Emergency Operation
Starting a Computer with the R-Studio Emergency Startup Disks
File Recovery
Searching for a File
Disk Scan
Disk Images

Hardware Compatibility List

6.5.1 Properties and Text/Hexadecimal Viewer

To view object properties,

1 **Select an object**

2 **Press the F7 key**

To view an object

1 **Select an object**

2 **Press the F3 key**

3 Press the **F6** key to view and select file attributes
Press the **Esc** key to close the viewer.

6.5.2 Network Drives

To map a network drive,

1 **On a dialog box with Map Network Drive, press the Alt+M key**

> **The** Querying DHCP **message will appear**
If the network has a DHCP server, the computer will obtain an IP address automatically. A list of adapters and their IP addresses will appear on the Network Adapters dialog box.
If the network does not have a DHCP server, select a network adapter on the Network Adapters dialog box and press the **F4** key. Enter the IP address and network mask and press the **Enter** button.

2 **Select a configured network adapter and press the Enter key**

3 **Enter the required information on the** Map Network Drive **message message**

Server IP Address:	IP address of the computer where the network drive is to reside.
Server Share Name:	Name of the shared folder where the network drive is to reside.
Login:	Username of a user on the computer where the network drive is to reside.
Password:	User's password on the computer where the network drive is to reside.

> **The mounted network disk will appear**

To disconnect a mounted network drive

1 **Select a mounted network drive**

2 **Switch to the Disconnect button and press the Enter key**

6.5.3 Log

To clear log information

* **Select Clear Log on the Tools menu**

To save log information to a file

* **Select Save Log To File on the Tools menu**

6.6 R-Studio Emergency Hardware Compatibility List

R-Studio Emergency supports the following hardware devices:

Data Storage Devices

Serial ATA and Parallel ATA drivers

ACPI firmware driver for PATA
AHCI SATA
ALi PATA
AMD/NVidia PATA
ARTOP 6210/6260 PATA
ARTOP/Acard ATP867X PATA
ATI PATA
CMD / Silicon Image 680 PATA
CMD640 PCI PATA
CMD64x PATA
CS5510/5520 PATA
CS5530 PATA
CS5535 PATA
CS5536 PATA
Compaq Triflex PATA
Cypress CY82C693 PATA
EFAR SLC90E66
Generic ATA
HPT 343/363 PATA
HPT 366/368 PATA
HPT 370/370A/371/372/374/302 PATA
HPT 372N/302N PATA
IT8211/2 PATA
IT8213 PATA
Initio 162x SATA
Intel ESB, ICH, PIIX3, PIIX4 PATA/SATA
Intel PATA MPIIX
Intel PATA old PIIX
Intel SCH PATA
JMicron PATA
Legacy ISA PATA
Marvell PATA support via legacy mode
Marvell SATA
NETCELL Revolution RAID
NVIDIA SATA

Networking Devices

Ethernet (10 or 100Mbit)

3c501 `EtherLink`
3c503 `EtherLink II`
3c505 `EtherLink Plus`
3c507 `EtherLink 16`
3c509/3c529 (MCA)/3c579 `EtherLink III`
3c515 ISA `Fast EtherLink`
3c590/3c900 series (592/595/597) `Vortex/ Boomerang`
3cr990 series `Typhoon`
AMD 8111 (new PCI lance)
AMD LANCE and PCnet (AT1500 and NE2100)
AMD PCnet32 PCI
AT1700/1720
Adaptec Starfire/DuraLAN
Ansel Communications EISA 3200
Apricot Xen-II on board Ethernet
Atheros L2 Fast Ethernet
Broadcom 440x/47xx ethernet
CS89x0
Cabletron E21xx
DECchip Tulip (dc2114x) PCI
Dave ethernet support (DNET)
Davicom DM910x/DM980x
Early DECchip Tulip (dc2104x) PCI
EtherExpress 16
EtherExpressPro support/EtherExpress 10 (i82595)
Generic DECchip & DIGITAL EtherWORKS PCI/ EISA
HP 10/100VG PCLAN (ISA, EISA, PCI)
HP PCLAN (27245 and other 27xxx series)
HP PCLAN+ (27247B and 27252A)
ICL EtherTeam 16i/32
Intel(R) PRO/100+
LP486E on board Ethernet
Myson MTD-8xx PCI Ethernet

Nat Semi NS87410 PATA
Nat Semi NS87415 PATA
Ninja32/Delkin Cardbus ATA
OPTI FireStar PATA
OPTI621/6215 PATA
Older Promise PATA controller
PCMCIA PATA
Pacific Digital ADMA
Pacific Digital SATA QStor
Platform AHCI SATA
Promise PATA 2027x
Promise SATA SX4
Promise SATA TX2/TX4
QDI VLB PATA
RADISYS 82600 PATA
RDC PATA
SC1200 PATA
SERVERWORKS OSB4/CSB5/CSB6/HT1000 PATA
ServerWorks Frodo / Apple K2 SATA
SiS 964/965/966/180 SATA
SiS PATA
Silicon Image 3124/3132 SATA
Silicon Image SATA
ULi Electronics SATA
VIA PATA
VIA SATA
VITESSE VSC-7174 / INTEL 31244 SATA
Winbond SL82C105 PATA
Winbond W83759A VLB PATA

SCSI low-level drivers

3ware 5/6/7/8xxx ATA-RAID
3ware 97xx SAS/SATA-RAID
3ware 9xxx SATA-RAID
7000FASST SCSI
ACARD SCSI
ARECA (ARC11xx/12xx/13xx/16xx) SATA/SAS RAID Host Adapter
Adaptec AACRAID
Adaptec AHA152X/2825

NE2000/NE1000
NI5010
NI5210
NI6510
National Semiconductor DP8381x series PCI Ethernet
OpenCores 10/100 Mbps Ethernet MAC
PCI NE2000 and clones support (see help)
RDC R6040 Fast Ethernet Adapter
RealTek RTL-8129/8130/8139 PCI Fast Ethernet Adapter
RealTek RTL-8139 C+ PCI Fast Ethernet Adapter
SEEQ8005
SMC 9194
SMC EtherPower II
SMC Ultra
SMSC LAN9420 PCI ethernet adapter
SiS 900/7016 PCI Fast Ethernet Adapter
Silan SC92031 PCI Fast Ethernet Adapter driver
Sun Cassini
Sun GEM
Sun Happy Meal 10/100baseT
Sundance Alta
TI ThunderLAN
ULi M526x controller
VIA Rhine
WD80*3
Winbond W89c840 Ethernet
Zenith Z-Note
nForce Ethernet

Ethernet (1000 Mbit)

Alteon AceNIC/3Com 3C985/NetGear GA620 Gigabit
Atheros L1C Gigabit Ethernet
Atheros L1E Gigabit Ethernet
Atheros/Attansic L1 Gigabit Ethernet
Broadcom CNIC
Broadcom NetXtremeII
Broadcom Tigon3
DL2000/TC902x-based Gigabit Ethernet
IP1000 Gigabit Ethernet

Adaptec AHA1542
Adaptec AIC79xx U320
Adaptec AIC7xxx
Adaptec AIC7xxx Fast -> U160
Adaptec AIC94xx SAS/SATA
Adaptec I2O RAID
AdvanSys SCSI
Always IN2000 SCSI
BusLogic SCSI
DMX3191D SCSI
DTC3180/3280 SCSI
EATA ISA/EISA/PCI (DPT and generic EATA/DMA-compliant boards)
Emulex LightPulse Fibre Channel Support
Future Domain 16xx SCSI/AHA-2920A
Generic NCR5380/53c400 SCSI MMIO
Generic NCR5380/53c400 SCSI PIO
HP Smart Array SCSI driver
HighPoint RocketRAID 3xxx/4xxx Controller
IBM Power Linux RAID adapter
IBM ServeRAID
Initio 9100U(W)
Initio INI-A100U2W
Intel/ICP (former GDT SCSI Disk Array) RAID Controller
LSI Logic Legacy MegaRAID Driver
LSI Logic Management Module
LSI Logic MegaRAID Driver
LSI Logic MegaRAID SAS RAID Module
LSI MPT Fusion SAS 2.0 Device Driver
Marvell 88SE64XX/88SE94XX SAS/SATA
NCR53c406a SCSI
PAS16 SCSI
PMC SIERRA Linux MaxRAID adapter
PMC-Sierra SPC 8001 SAS/SATA Based Host Adapter driver
Promise SuperTrak EX Series
QLogic ISP4XXX host adapter family
QLogic QLA2XXX Fibre Channel Support
Qlogic FAS SCSI
Qlogic QLA 1240/1x80/1x160 SCSI
Intel(R) 82575/82576 PCI-Express Gigabit Ethernet
Intel(R) 82576 Virtual Function Ethernet
Intel(R) PRO/1000 Gigabit Ethernet
Intel(R) PRO/1000 PCI-Express Gigabit Ethernet
JMicron(R) PCI-Express Gigabit Ethernet
National Semiconductor DP83820
New SysKonnect GigaEthernet
Packet Engines Hamachi GNIC-II
Packet Engines Yellowfin Gigabit-NIC
QLogic QLA3XXX Network Driver Support
Realtek 8169 gigabit ethernet
SiS190/SiS191 gigabit ethernet
SysKonnect Yukon2
VIA Velocity

Ethernet (10000 Mbit)

Broadcom NetXtremeII 10Gb
Chelsio 10Gb Ethernet
Chelsio Communications T3 10Gb Ethernet
Chelsio Communications T4 Ethernet
Cisco VIC Ethernet NIC Support
Intel(R) 10GbE PCI Express adapters
Intel(R) PRO/10GbE
Mellanox Technologies 10Gbit Ethernet
Myricom Myri-10G Ethernet
NetXen Multi port (1/10) Gigabit Ethernet NIC
Neterion X3100 Series 10GbE PCIe Server Adapter
QLOGIC QLCNIC 1/10Gb Converged Ethernet NIC Support
QLogic QLGE 10Gb Ethernet Driver Support
S2IO 10Gbe XFrame NIC
ServerEngines' 10Gbps NIC - BladeEngine
Solarflare Solarstorm SFC4000/SFC9000-family
Sun Neptune 10Gbit Ethernet
Tehuti Networks 10G Ethernet

Token Ring driver support

3Com 3C359 Token Link Velocity XL adapter
Generic TMS380 PCI
Generic TMS380 Token Ring ISA/PCI adapter
IBM Lanstreamer chipset PCI adapter
IBM Olympic chipset PCI adapter

SYM53C8XX Version 2 SCSI
Symbios 53c416 SCSI
Tekram DC390(T) and Am53/79C974 SCSI
Tekram DC395(U/UW/F) and DC315(U) SCSI
Trantor T128/T128F/T228 SCSI
UltraStor 14F/34F
UltraStor SCSI
VMware PVSCSI driver
Workbit NinjaSCSI-32Bi/UDE

USB support

Cypress C67x00 HCD
Datafab Compact Flash Reader
Freecom USB/ATAPI Bridge
ISD-200 USB/ATA Bridge
ISP 1760 HCD
ISP116X HCD
ISP1362 HCD
Lexar Jumpshot Compact Flash Reader
OXU210HP HCD
Olympus MAUSB-10/Fuji DPC-R1
R8A66597 HCD
SL811HS HCD
SanDisk SDDR-09 (and other SmartMedia, including DPCM)
SanDisk SDDR-55 SmartMedia
USB 2.0
USB Mass Storage
USB Monitor
USBAT/USBAT02-based storage
xHCI HCD (USB 3.0)

Block devices

Compaq SMART2
Compaq Smart Array 5xxx
Mylex DAC960/DAC1100 PCI RAID Controller
Normal floppy disk
Promise SATA SX8

IEEE 1394 (FireWire) support

Legacy alternative FireWire driver stack
Storage devices (SBP-2 protocol)

IBM Tropic chipset based adapter
Madge Smart 16/4 PCI Mk2
Proteon ISA
SMC ISA/MCA adapter
SysKonnect TR4/16 ISA

USB Network Adapters

ASIX AX88xxx Based USB 2.0 Ethernet Adapters
CDC EEM
CDC Ethernet support (smart devices such as cable modems)
Davicom DM9601 based USB 1.1 10/100 ethernet devices
GeneSys GL620USB-A based cables
Host for RNDIS and ActiveSync devices
MosChip MCS7830 based Ethernet adapters
NetChip 1080 based cables (Laplink, ...)
Prolific PL-2301/2302 based cables
SMSC LAN95XX based USB 2.0 10/100 ethernet devices
Sharp Zaurus (stock ROMs) and compatible
Simple USB Network Links (CDC Ethernet subset)
USB CATC NetMate-based Ethernet device
USB KLSI KL5USB101-based ethernet device
USB Pegasus/Pegasus-II based ethernet device
USB RTL8150 based ethernet device

PCMCIA network device support

- 3Com 3c574 PCMCIA
- 3Com 3c589 PCMCIA
- Asix AX88190 PCMCIA
- COM20020 ARCnet PCMCIA
- Fujitsu FMV-J18x PCMCIA
- NE2000 compatible PCMCIA
- New Media PCMCIA
- SMC 91Cxx PCMCIA
- Xircom 16-bit PCMCIA

Other devices

- Microsoft Hyper-V Utilities driver
- Microsoft Hyper-V client drivers
- Microsoft Hyper-V virtual block driver
- Microsoft Hyper-V virtual network driver
- Microsoft Hyper-V virtual storage driver

VII R-Studio Agent Emergency

R-Studio Agent Emergency is a tool that allows you to start a network computer with a damaged startup disk and recover data stored on its hard drives. Then restored data can be transferred to a working computer via the network.

It works very simple: Just start the computer with the **R-Studio Agent Emergency** startup disk(s) and, if necessary, manually configure a network interface for **R-Studio Agent Emergency**. When started, the computer and its hard drives can be accessed by **R-Studio** installed on another computer on the network.

Contact Information and Technical Support
Installing R-Studio Agent Emergency Startup Media Creator
Creating Startup Disks
Starting a Computer with the R-Studio Agent Emergency Startup Disk

Hardware Compatibility List
  Disk Controllers
  Network Cards

7.1 Contact Information and Technical Support

To obtain the latest version of **R-Studio Agent Emergency**, go to:

Product Site: http://www.r-tt.com
Sales Department: sales@r-tt.com

R-Studio Technical Support Team is available 24 hours a day, seven days a week, and has an average response time less than 4 hours.

Tech. Support: support@r-tt.com
Send your support request to: http://www.r-tt.com/Support_request.html

7.2 Installing R-Studio Agent Emergency Startup Media Creator

Attention Windows NT/2000/XP/2003/Vista/2008/7 users! You must have administrative privileges to install R-Studio Agent Emergency Startup Media Creator.

If you are not sure whether you have such privileges, you almost certainly do not have them. Contact your system administrator for assistance.

1. Run the setup file.
2. Follow the on-screen instructions.

You may create startup disks even before the installation ends.

7.3 Creating Startup Disks

You need to create either

- A startup CD/DVD disc. You may create an ISO image, or write the disc directly from **R-Studio** Emergency Startup Media Creator, if there is a CD/DVD recorder in your system.

  or

- A startup FAT/FAT32 removable device recognized by your system as a bootable one. The total available size

of the device should be more than 10 MB.

or

- 4 formatted floppy disks

Check the Hardware Compatibility List.

When **R-Studio Agent Emergency Startup Media Creator** starts, its Welcome dialog box appears:

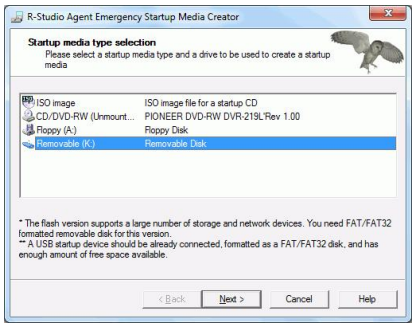
Welcome to **R-Studio Agent** Emergency Startup Media Creator **dialog box**

Welcome **dialog box**

R-Studio Agent Emergency Startup Media Creator
Welcome to R-Studio Agent Emergency Startup Media Creator
This program creates R-Studio Agent Emergency 5.3 Build 996 startup media. Using these media, you will be able to startup a computer with a damaged startup disk and recover data stored on its hard drives.
Click Next to continue, or Cancel to exit.
< Back
Next >
Cancel
Help

click the **Next** button to see the list of all devices on which startup disks may be created.

Startup media type selection **dialog box**

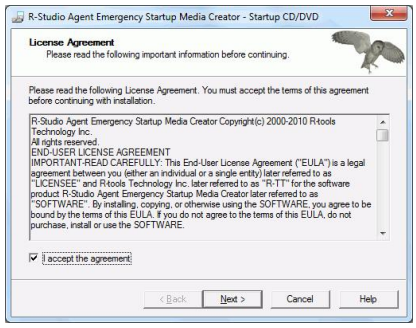

R-Studio Agent Emergency Startup Media Creator
Startup media type selection
Please select a startup media type and a drive to be used to create a startup media
ISO image
ISO image file for a startup CD
CD/DVD-RW (Unmount...
PIONEER DVD-RW DVR-219L Rev 1.00
Floppy (A:)
Floppy Disk
Removable (K:)
Removable Disk
* The flash version supports a large number of storage and network devices. You need FAT/FAT32 formatted removable disk for this version.
** A USB startup device should be already connected, formatted as a FAT/FAT32 disk, and has enough amount of free space available.
< Back
Next >
Cancel
Help

To create a startup CD/DVD disc directly on your CD/DVD writer (if present):

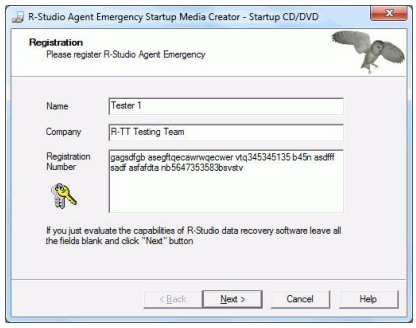
1. Run **R-Studio Agent Emergency**
2. **Select the CD/DVD writer on the** Startup media type selection **dialog box and click the Next button**
3. **Read and accept the License Agreement and enter the R-Studio Agent registration key on the R-Studio** Agent Emergency Activation **dialog box and click the Next button**

   Note: You should enter the registration key of **R-Studio Agent**, not **R-Studio** itself.

R-Studio Agent Emergency License Agreement **dialog box**


R-Studio Agent Emergency Startup Media Creator - Startup CD/DVD
License Agreement
Please read the following important infomation before continuing.
Please read the following License Agreement. You must accept the terms of this agreement before continuing with installation.
R-Studio Agent Emergency Startup Media Creator Copyright(c) 2000-2010 R-tools Technology Inc.
All rights reserved.
END-USER LICENSE AGREEMENT
IMPORTANT-READ CAREFULLY: This End-User License Agreement ("EULA") is a legal agreement between you (either an individual or a single entity) later referred to as "LICENSEE" and R-tools Technology Inc. later referred to as "R-TT" for the software product R-Studio Agent Emergency Startup Media Creator later referred to as "SOFTWARE". By installing, copying, or otherwise using the SOFTWARE, you agree to be bound by the terms of this EULA. If you do not agree to the terms of this EULA, do not purchase, install or use the SOFTWARE.
I accept the agreement
< Back
Next >
Cancel
Help

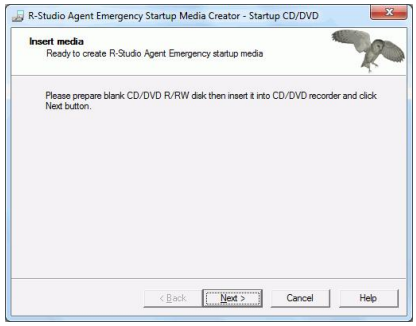
R-Studio Agent Emergency Activation **dialog box**


R-Studio Agent Emergency Startup Media Creator - Startup CD/DVD
Registration
Please register R-Studio Agent Emergency
Name
Tester 1
Company
R-TT Testing Team
Registration Number
gagsdfgb asegftqecawrwqecwer vtq345345135 b45n asdfff sadf asfafdta nb5647353583bsvstv
If you just evaluate the capabilities of R-Studio data recovery software leave all the fields blank and click "Next" button
< Back
Next >
Cancel
Help

if you do not enter the registration key, **R-Studio Agent** Emergency will work in the Demo mode. You may enter the key later when **R-Studio Agent** Emergency and **R-Studio** establish a connection

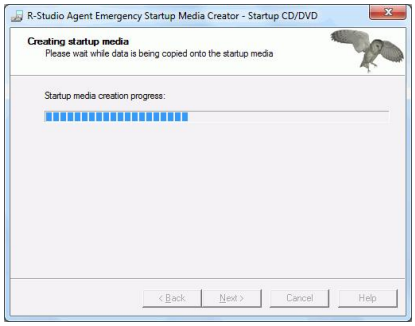
4 Insert a blank CD/DVD disk into the CD/DVD recorder and click the Next button

Insert media disc **dialog box**


R-Studio Agent Emergency Startup Media Creator - Startup CD/DVD
Insert media
Ready to create R-Studio Agent Emergency startup media
Please prepare blank CD/DVD R/RW disk then insert it into CD/DVD recorder and click Next button.
< Back
Next >
Cancel
Help

> **R-Studio Agent Emergency Startup Media Creator will start creating the startup CD/DVD disc showing the progress on the** Creating startup media **dialog box**

Creating startup media **dialog box**


R-Studio Agent Emergency Startup Media Creator - Startup CD/DVD
Creating startup media
Please wait while data is being copied onto the startup media
Startup media creation progress:
< Back
Next >
Cancel
Help

When R-Studio Agent Emergency Startup Media Creator finishes creating the startup CD/DVD disc, the R-Studio Agent Emergency Startup Media Creation is Finished **message will appear**

You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Back** button.

R-Studio Agent Emergency Startup Media Creation is Finished **message**

R-Studio Agent Emergency Startup Media Creator - Startup CD/DVD
R-Studio Agent Emergency Startup Media Creator Startup Media Creation is Finished
The startup CD/DVD has been created successfully.
Click Back to create other media or Finish to exit.
< Back
Finish
Help

To create an ISO image of a startup CD/DVD disc

1 **Run R-Studio Agent Emergency**

2 **Select ISO Image for a startup CD/DVD on the R-Studio** Agent Emergency Startup Media Creator **dialog box and click the Next button**

3 **Read and accept the License Agreement and enter the R-Studio Agent registration key on the R-Studio Agent** Emergency Activation **dialog box and click the Next button**

Note: You should enter the registration key of **R-Studio Agent**, not **R-Studio** itself.

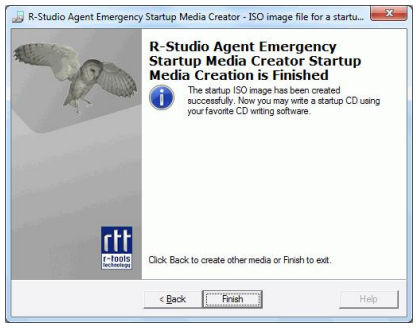
if you do not enter the registration key, **R-Studio Agent** Emergency will work in the Demo mode. You may enter the key later when **R-Studio Agent** Emergency and **R-Studio** establish a connection.

4 **Select a place and file name for the ISO image of the startup CD/DVD and click the Save button**

> **When R-Studio Bootable Startup Media Creator finishes writing the file with the ISO image, the R-Studio** Agent Emergency Startup Media Creation is Finished **message will appear**

You may either exit **R-Studio Bootable Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Back** button.

R-Studio Agent Emergency Startup Media Creation is Finished **dialog box**


R-Studio Agent Emergency Startup Media Creator - ISO image file for a startu...
R-Studio Agent Emergency Startup Media Creator Startup Media Creation is Finished
The startup ISO image has been created successfully. Now you may write a startup CD using your favorite CD writing software.
Click Back to create other media or Finish to exit.
< Back
Finish
Help

5 **Create the startup CD/DVD using your favorite CD/DVD creation software**

Load the created ISO image into the CD/DVD creation software. Consult documentation for the software for details.

To create a startup FAT/FAT32 removable device

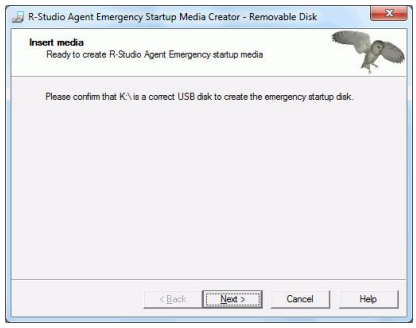
1 **Run R-Studio Agent Emergency**

2 **Select the removable device on the** Startup media type selection **dialog box and click the Next button**

3 **Read and accept the License Agreement and enter the registration key on the R-Studio Agent** Emergency Activation **dialog box and click the Next button**

4 **Check that the correct FAT/FAT32-formatted device is selected and click the Next button**

Confirm device selection **dialog box**

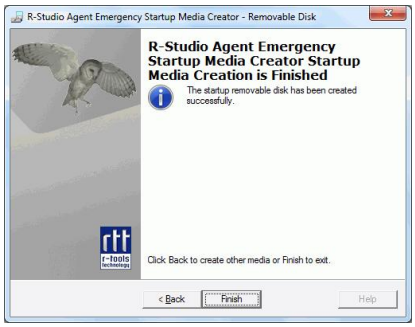

R-Studio Agent Emergency Startup Media Creator - Removable Disk
Insert media
Ready to create R-Studio Agent Emergency startup media
Please confirm that K:\ is a correct USB disk to create the emergency startup disk.
< Back
Next >
Cancel
Help

> **R-Studio Agent Emergency Startup Media Creator will start creating the startup USB disk showing the progress on the** Creating startup media **dialog box**

When R-Studio Agent Emergency Startup Media Creator finishes creating the startup device, the R-Studio Agent Emergency Startup Media Creation is Finished **message will appear**

You may either exit **R-Studio Emergency Startup Media Creator** by clicking the **Finish** button or create another startup media by clicking the **Back** button.

R-Studio Agent Emergency Startup Media Creation is Finished **dialog box**


R-Studio Agent Emergency Startup Media Creator - Removable Disk
R-Studio Agent Emergency Startup Media Creator Startup Media Creation is Finished
The startup removable disk has been created successfully.
Click Back to create other media or Finish to exit.
< Back
Finish
Help

To create floppy disks:

You will need 4 formatted floppy disks.

1 **Run R-Studio Agent Emergency**

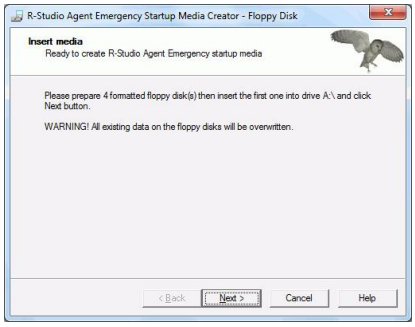
2 **Select Floppy Disk for the startup floppy disk on the R-Studio** Agent Emergency Startup Media Creator **dialog box and click the Next button**

3 **Enter the registration information and number on the** Registration **dialog box and click the Next button**

If you leave all the field blank, **R-Studio Agent Emergency** will work with the **Demo-version limitations**

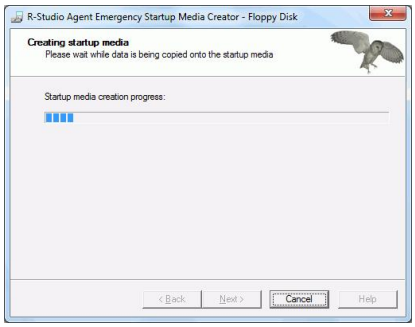
4 **Insert the floppy disk and click the Next button on the** Insert floppy **dialog box**

Insert floppy **dialog box**

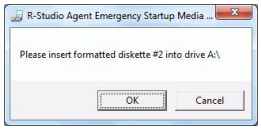

R-Studio Agent Emergency Startup Media Creator - Floppy Disk
Insert media
Ready to create R-Studio Agent Emergency startup media
Please prepare 4 formatted floppy disk(s) then insert the first one into drive A:\ and click Next button.
WARNING! All existing data on the floppy disks will be overwritten.
< Back
Next >
Cancel
Help

> **R-Studio Agent Emergency Startup Media Creator will start creating the startup floppy disk showing the progress on the** Creating startup media **dialog box**

Creating startup media **dialog box**


R-Studio Agent Emergency Startup Media Creator - Floppy Disk
Creating startup media
Please wait while data is being copied onto the startup media
Startup media creation progress:
< Back
Next >
Cancel
Help

5 **Insert the second floppy disk and click the OK button when the** Please insert formatted diskette #2 into drive A: **message will appear**



Do it with the next 2 floppy disks.

> **When R-Studio Startup Media Creator finishes creating the startup floppy disk, the R-Studio** Agent Emergency Startup Media Creation is Finished **message will appear. You may either exit R-Studio Startup Media Creator by clicking the Finish button or create another startup media by clicking the Back button.**

R-Studio Agent Emergency Startup Media Creation is Finished **dialog box**

R-Studio Agent Emergency Startup Media Creator - Floppy Disk
R-Studio Agent Emergency Startup Media Creator Startup Media Creation is Finished
The startup floppy disk(s) have been created successfully.
Click Back to create other media or Finish to exit.
< Back
Finish
Help

7.4 Starting a Computer with the R-Studio Agent Emergency Startup Disk

We recommended that you print out this help page and have the hardcopy on hand while you are performing this action.

Before you start the computer you should be aware that your network has a DHCP server or you know the computer's IP address and network mask.

If there is a non-IDE disk controller in your system, or you plan to use network disks or external hardware devices, first check the Hardware Compatibility List.

If you plan to use any external device, turn it on before starting the system.

If the motherboard in your computer supports the Serial ATA (SATA) devices, but IDE disks are also present, only the SATA devices should be set to the Enhanced Mode in BIOS.

To start the computer with the R-Studio Agent Emergency startup disks

1 **Make sure that the first startup device in the system BIOS is the device from which you plan to start your computer (a CD/DVD drive or A (Floppy))**

Disable "Secure boot" in the system BIOS if your computer is certified to run Windows 8. Refer to your system documentation for details. Refer to your system documentation for details.

2 **Insert the R-Studio Agent Emergency startup CD/DVD disc, a removable device, or the first floppy disk and start your computer**

> **R-Studio Agent Emergency will start and its prompt will appear**

If you start your computer with floppy disks, you'll see prompts to insert a next floppy disk.

```
  ----------------------------------------------------------------
  Booting R-Studio Emergency. Please wait...
```

```
Waiting 8 seconds for PCMCIA devices to settle
Booting R-Studio Agent Emergency. Now you may remove floppy.
------------------------------------------------------------------
Querying DHCP to configure network interfaces...
Press ENTER within 10 seconds to configure them manually.
```

If your network has a DHCP server

The computer running R-Studio Agent Emergency will be assigned an IP address automatically

A prompt with a computer address will appear. You need to remember it to access the computer via network.

If your network does not have a DHCP server

You need to configure the interfaces and IP addresses manually.

1. A prompt to select an interface will appear. Enter the selected interface name and press **Enter**.
2. A prompt to enter its IP address and optional subnet mask will appear. Enter the IP address and optional subnet mask and press **Enter**.

```
------------------------[ List of
Interfaces ]--------------------------------
Name           IP Address            NETMASK            Vendor
------------------------------------------------------------------
------------
re0            Unconfigured                             RealTek
8139C+
------------------------------------------------------------------
------------
# Enter interface name, 'gw' for default gateway or just press
ENTER to finish
#>re0
# Enter IP address and optional NETMASK delimited by space
#>192.168.0.10 255.255.255.0
```

3. A prompt to configure another interface, gateway, or to finish configuring the interfaces will appear. Enter `gw`, enter the IP address of the gateway, and press **Enter**.

```
------------------------[ List of
Interfaces ]--------------------------------
Name           IP Address            NETMASK          Vendor
------------------------------------------------------------------
------------
re0            Unconfigured                           RealTek
8139C+
------------------------------------------------------------------
------------
# Enter interface name, 'gw' for default gateway or just press
ENTER to finish
#>re0
# Enter IP address and optional NETMASK delimited by space
#>192.168.0.10 255.255.255.0

------------------------[ List of
Interfaces ]--------------------------------
Name           IP Address            NETMASK            Vendor
------------------------------------------------------------------
------------
```

```
re0             192.168.0.10          255.255.255.0      RealTek
8139C+
gw              Unconfigured                             Default
gateway
------------------------------------------------------------------------
------------
# Enter interface name, 'gw' for default gateway or just press
ENTER to finish
#>gw
# Enter default gateway IP Address
#>192.168.0.1

------------------------[ List of
Interfaces ]--------------------------------
Name            IP Address            NETMASK            Vendor
------------------------------------------------------------------------
------------
re0             192.168.0.10          255.255.255.0      RealTek
8139C+
gw              192.168.0.1                              Default
gateway
------------------------------------------------------------------------
------------
# Enter interface name, 'gw' for default gateway or just press
ENTER to finish
#>
```

4. Press **Enter** to finish configuring the interfaces, or enter the name of the next interface to configure.

> **R-Studio Agent Emergency will show a prompt that is ready to accept connections**

```
* R-Studio Agent started and ready to accept connections...
* You may press ENTER to start to remote R-Studio...
```

Now the computer may be accessed by **R-Studio** via network.

Secure boot:

It may be impossible to start a Windows 8 certified computer with the R-Studio Agent Emergency startup disk without some additional actions. This happens because any computer should use a so-called "Secure boot" procedure to comply with Windows 8 hardware certification from Microsoft. In brief, this procedure prevents computer from booting into any operating system that isn't digitally signed with an appropriate digital signature. "Secure boot" is claimed to prevent unauthorized modification of the boot sector by bootkits, viruses, trojans, and other malicious software. To the date, only Windows 8, Windows Server 2012, and selected Linux distributions support this feature. As a side effect, it also prevents most LiveCDs, rescue disks (R-Studio and R-Drive Image included), and other OS from running.

Likely enough, the other requirement of Windows 8 hardware certification is to make it possible for the user to disable the Secure boot procedure. Those settings can be done through the system BIOS under the Boot options. Generally, it's enough to enable Legacy support in those options, but sometimes it may require additional actions. Please, refer to your system documentation to learn more about disabling/enabling Secure boot.

When Secure boot is disabled, it should be possible to start the computer with the R-Studio Agent Emergency startup disk.

Please note that you should enable this feature back after using the startup disks because Windows 8 or Server 2012 may not start properly without the Secure boot feature enabled.

Starting a Connection from R-Studio Agent Emergency

When you need to connect **R-Studio** and **R-Studio Agent Emergency** over the Internet, it may be necessary to start the connection from the computer where **R-Studio Agent Emergency** is running.

To connect to R-Studio's computer,

1 **Press the Enter key and enter the IP address of the computer where R-Studio is running as** `IPaddress:port`.

```
 * R-Studio Agent started and ready to accept connections...
 * You may press ENTER to start connection to remote R-Studio...
# Enter R-Studio IP address or just press ENTER to cancel>
192.168.0.25:80
```

The default port is 8080, and you don't have to specify it.

2 **Enter the password if required, and press the Enter key.**

```
 * R-Studio Agent started and ready to accept connections...
 * You may press ENTER to start connection to remote R-Studio...
# Enter R-Studio IP address or just press ENTER to cancel>
192.168.0.25:80
# Enter password or just press ENTER to connect without
one>PaSsWoRd1234
```

> **When the connection is established successfully, R-Studio Agent Emergency will notify you about this.**

```
 * R-Studio Agent started and ready to accept connections...
 * You may press ENTER to start connection to remote R-Studio...
# Enter R-Studio IP address or just press ENTER to cancel>
192.168.0.25:80
# Enter password or just press ENTER to connect without
one>PaSsWoRd1234
Connection with 192.168.0.25:80 is established successfully.
```

7.5 R-Studio Agent Emergency Hardware Compatibility List

Disk Controllers
Network Cards

R-Studio Agent Emergency
- **Contact Information and Technical Support**
- **Installing R-Studio Agent Emergency Startup Media Creator**
- **Creating Startup Disks**
- **Starting a Computer with the R-Studio Agent Emergency Startup Disk**

7.5.1 Disk Controllers

R-Studio Agent Emergency is based on the **FreeBSD 5.3** kernel and supports devices from the list published at http://www.freebsd.org/releases/5.3R/hardware-i386.html.

*: Supported in the floppy version

Disk controllers

IDE/ATA controllers (ata driver) *

The adapters supported by the aic driver include:

Adaptec AHA-1505 (ISA)
Adaptec AHA-1510A, AHA-1510B (ISA)
Adaptec AHA-1520A, AHA-1520B (ISA)
Adaptec AHA-1522A, AHA-1522B (ISA)
Adaptec AHA-1535 (ISA)
Creative Labs SoundBlaster SCSI host adapter (ISA)
Adaptec AHA-1460, AHA-1460B, AHA-1460C, AHA-1460D (PC Card)
Adaptec AHA-1030B, AHA-1030P (PC98)
NEC PC-9801-100 (PC98)

The aha driver supports the following SCSI host adapters:

Adaptec AHA-154xB
Adaptec AHA-154xC
Adaptec AHA-154xCF
Adaptec AHA-154xCP
Adaptec AHA-1640
Adaptec AHA-174x in 154x emulation mode
DTC 3290 SCSI controller in 1542 emulation mode
Tekram SCSI controllers in 154x emulation mode

The ahb driver supports the following SCSI host adapters:

Adaptec AHA-1740
Adaptec AHA-1742
Adaptec AHA-1740A
Adaptec AHA-1742A

The ahc driver supports the following SCSI host adapter chips and SCSI controller cards:

Adaptec AIC7770 host adapter chip
Adaptec AIC7850 host adapter chip
Adaptec AIC7860 host adapter chip
Adaptec AIC7870 host adapter chip
Adaptec AIC7880 host adapter chip
Adaptec AIC7890 host adapter chip
Adaptec AIC7891 host adapter chip
Adaptec AIC7892 host adapter chip
Adaptec AIC7895 host adapter chip
Adaptec AIC7896 host adapter chip
Adaptec AIC7897 host adapter chip
Adaptec AIC7899 host adapter chip
Adaptec 274X(W)
Adaptec 274X(T)
Adaptec 284X
Adaptec 2910

Adaptec 2915
Adaptec 2920
Adaptec 2930C
Adaptec 2930U2
Adaptec 2940
Adaptec 2940J
Adaptec 2940N
Adaptec 2940U
Adaptec 2940AU
Adaptec 2940UW
Adaptec 2940UW Dual
Adaptec 2940UW Pro
Adaptec 2940U2W
Adaptec 2940U2B
Adaptec 2950U2W
Adaptec 2950U2B
Adaptec 19160B
Adaptec 29160B
Adaptec 29160N
Adaptec 3940
Adaptec 3940U
Adaptec 3940AU
Adaptec 3940UW
Adaptec 3940AUW
Adaptec 3940U2W
Adaptec 3950U2
Adaptec 3960
Adaptec 39160
Adaptec 3985
Adaptec 4944UW
NEC PC-9821Xt13 (PC-98)
NEC RvII26 (PC-98)
NEC PC-9821X-B02L/B09 (PC-98)
NEC SV-98/2-B03 (PC-98)
Many motherboards with on-board SCSI support

The ahd driver supports the following:

Adaptec AIC7901 host adapter chip
Adaptec AIC7901A host adapter chip
Adaptec AIC7902 host adapter chip
Adaptec 29320 host adapter
Adaptec 39320 host adapter
Many motherboards with on-board SCSI support

Controllers supported by the aac driver include:

Adaptec AAC-364
Adaptec SCSI RAID 2120S

Adaptec SCSI RAID 2130S
Adaptec SCSI RAID 2200S
Adaptec SCSI RAID 2410SA
Adaptec SCSI RAID 2810SA
Adaptec SCSI RAID 5400S
Dell CERC SATA RAID 2
Dell PERC 2/Si
Dell PERC 2/QC
Dell PERC 3/Si
Dell PERC 3/Di
Dell PERC 320/DC
HP NetRAID 4M

The adv driver supports the following SCSI controllers:

AdvanSys ABP510/5150
AdvanSys ABP5140
AdvanSys ABP5142
AdvanSys ABP902/3902
AdvanSys ABP3905
AdvanSys ABP915
AdvanSys ABP920
AdvanSys ABP3922
AdvanSys ABP3925
AdvanSys ABP930, ABP930U, ABP930UA
AdvanSys ABP960, ABP960U
AdvanSys ABP542
AdvanSys ABP742
AdvanSys ABP842
AdvanSys ABP940
AdvanSys ABP940UA/3940UA
AdvanSys ABP940U
AdvanSys ABP3960UA
AdvanSys ABP970, ABP970U
AdvanSys ABP752
AdvanSys ABP852
AdvanSys ABP950
AdvanSys ABP980, ABP980U
AdvanSys ABP980UA/3980UA
MELCO IFC-USP (PC-98)
RATOC REX-PCI30 (PC-98)
@Nifty FNECHARD IFC-USUP-TX (PC-98)

The adw driver supports SCSI controllers including:

AdvanSys ABP940UW/ABP3940UW
AdvanSys ABP950UW
AdvanSys ABP970UW
AdvanSys ABP3940U2W

AdvanSys ABP3950U2W

The bt driver supports the following BusLogic MultiMaster ``W'', ``C'', ``S'', and ``A'' series and compatible SCSI host adapters:

BusLogic BT-445C
BusLogic BT-445S
BusLogic BT-540CF
BusLogic BT-542B
BusLogic BT-542B
BusLogic BT-542D
BusLogic BT-545C
BusLogic BT-545S
BusLogic/BusTek BT-640
BusLogic BT-742A
BusLogic BT-742A
BusLogic BT-747C
BusLogic BT-747D
BusLogic BT-747S
BusLogic BT-757C
BusLogic BT-757CD
BusLogic BT-757D
BusLogic BT-757S
BusLogic BT-946C
BusLogic BT-948
BusLogic BT-956C
BusLogic BT-956CD
BusLogic BT-958
BusLogic BT-958D
Storage Dimensions SDC3211B / SDC3211F
AMI FastDisk Host Adapters that are true BusLogic MultiMaster clones are also supported by the bt driver.

The dpt driver provides support for the following RAID adapters:

DPT Smart Cache Plus
Smart Cache II (PM2??2?, PM2022 [EISA], PM2024/PM2124 [PCI]) (Gen2)
Smart RAID II (PM3??2?, PM3021, PM3222)
Smart Cache III (PM2??3?)
Smart RAID III (PM3??3?, PM3332 [EISA], PM3334UW [PCI]) (Gen3)
Smart Cache IV (PM2??4?, PM2042 [EISA], PM2044/PM2144 [PCI]) (Gen4)
Smart RAID IV

The adapters currently supported by the asr driver include the following:

Adaptec Zero-Channel SCSI RAID 2000S, 2005S, 2010S, 2015S
Adaptec SCSI RAID 2100S, 2110S
Adaptec ATA-100 RAID 2400A
Adaptec SCSI RAID 3200S, 3210S
Adaptec SCSI RAID 3400S, 3410S
Adaptec SmartRAID PM1554
Adaptec SmartRAID PM1564

Adaptec SmartRAID PM2554
Adaptec SmartRAID PM2564
Adaptec SmartRAID PM2664
Adaptec SmartRAID PM2754
Adaptec SmartRAID PM2865
Adaptec SmartRAID PM3754
Adaptec SmartRAID PM3755U2B / SmartRAID V Millennium
Adaptec SmartRAID PM3757
DEC KZPCC-AC (LVD 1-ch, 4MB or 16MB cache), DEC KZPCC-CE (LVD 3-ch, 64MB cache), DEC KZPCC-XC (LVD 1-ch, 16MB cache), DEC KZPCC-XE (LVD 3-ch, 64MB cache) -- rebadged SmartRAID V Millennium

The amr driver supports the following:

AMI MegaRAID 320-1
AMI MegaRAID 320-2
AMI MegaRAID 320-4X
AMI MegaRAID Series 418
AMI MegaRAID Enterprise 1200 (Series 428)
AMI MegaRAID Enterprise 1300 (Series 434)
AMI MegaRAID Enterprise 1400 (Series 438)
AMI MegaRAID Enterprise 1500 (Series 467)
AMI MegaRAID Enterprise 1600 (Series 471)
AMI MegaRAID Elite 1500 (Series 467)
AMI MegaRAID Elite 1600 (Series 493)
AMI MegaRAID Elite 1650 (Series 4xx)
AMI MegaRAID Express 100 (Series 466WS)
AMI MegaRAID Express 200 (Series 466)
AMI MegaRAID Express 300 (Series 490)
AMI MegaRAID Express 500 (Series 475)
Dell PERC
Dell PERC 2/SC
Dell PERC 2/DC
Dell PERC 3/DCL
Dell PERC 3/QC
Dell PERC 4/Di
HP NetRAID-1/Si
HP NetRAID-3/Si (D4943A)
HP Embedded NetRAID

Note: Booting from these controllers is supported. EISA adapters are not supported.

Controllers supported by the mlx driver include:

Mylex DAC960P
Mylex DAC960PD / DEC KZPSC (Fast Wide)
Mylex DAC960PDU
Mylex DAC960PL
Mylex DAC960PJ
Mylex DAC960PG

Mylex DAC960PU / DEC PZPAC (Ultra Wide)
Mylex AcceleRAID 150 (DAC960PRL)
Mylex AcceleRAID 250 (DAC960PTL1)
Mylex eXtremeRAID 1100 (DAC1164P)
RAIDarray 230 controllers, aka the Ultra-SCSI DEC KZPAC-AA (1-ch, 4MB cache), KZPAC-CA (3-ch, 4MB), KZPAC-CB (3-ch, 8MB cache)
All major firmware revisions (2.x, 3.x, 4.x and 5.x) are supported, however it is always advisable to upgrade to the most recent firmware available for the controller. Compatible Mylex controllers not listed should work, but have not been verified.
Note: Booting from these controllers is supported. EISA adapters are not supported.

Controllers supported by the mly driver include:

Mylex AcceleRAID 160
Mylex AcceleRAID 170
Mylex AcceleRAID 352
Mylex eXtremeRAID 2000
Mylex eXtremeRAID 3000
Compatible Mylex controllers not listed should work, but have not been verified.

The twe driver supports the following ATA RAID controllers:

AMCC's 3ware 5000 series
AMCC's 3ware 6000 series
AMCC's 3ware 7000-2
AMCC's 3ware 7006-2
AMCC's 3ware 7500-4LP
AMCC's 3ware 7500-8
AMCC's 3ware 7500-12
AMCC's 3ware 7506-4LP
AMCC's 3ware 7506-8
AMCC's 3ware 7506-12
AMCC's 3ware 8006-2LP
AMCC's 3ware 8500-4LP
AMCC's 3ware 8500-8
AMCC's 3ware 8500-12
AMCC's 3ware 8506-4LP
AMCC's 3ware 8506-8
AMCC's 3ware 8506-8MI
AMCC's 3ware 8506-12
AMCC's 3ware 8506-12MI

The twa driver supports the following PATA/SATA RAID controllers:

AMCC's 3ware 9500S-4LP
AMCC's 3ware 9500S-8
AMCC's 3ware 9500S-8MI
AMCC's 3ware 9500S-12
AMCC's 3ware 9500S-12MI

The ncr driver provides support for the following NCR/Symbios SCSI controller chips:

53C810
53C810A
53C815
53C820
53C825A
53C860
53C875
53C875J
53C885
53C895
53C895A
53C896
53C1510D

The following add-on boards are known to be supported:

I-O DATA SC-98/PCI (PC-98)
I-O DATA SC-PCI (PC-98)

The sym driver provides support for the following Symbios/LSI Logic PCI SCSI controllers:

53C810
53C810A
53C815
53C825
53C825A
53C860
53C875
53C876
53C895
53C895A
53C896
53C897
53C1000
53C1000R
53C1010-33
53C1010-66
53C1510D

The SCSI controllers supported by sym can be either embedded on a motherboard, or on one of the following add-on boards:

ASUS SC-200, SC-896
Data Technology DTC3130 (all variants)
DawiControl DC2976UW
Diamond FirePort (all)
I-O DATA SC-UPCI (PC-98)
Logitec LHA-521UA (PC-98)
NCR cards (all)

Symbios cards (all)
Tekram DC390W, 390U, 390F, 390U2B, 390U2W, 390U3D, and 390U3W
Tyan S1365

The following devices are currently supported by the ncv driver:

I-O DATA PCSC-DV
KME KXLC002 (TAXAN ICD-400PN, etc.), KXLC004, and UJDCD450
Macnica Miracle SCSI-II mPS110
Media Intelligent MSC-110, MSC-200
NEC PC-9801N-J03R
New Media Corporation BASICS SCSI
Qlogic Fast SCSI
RATOC REX-9530, REX-5572 (SCSI only)

Controllers supported by the stg driver include:

Adaptec 2920/A
Future Domain SCSI2GO
Future Domain TMC-18XX/3260
IBM SCSI PCMCIA Card
ICM PSC-2401 SCSI
MELCO IFC-SC
RATOC REX-5536, REX-5536AM, REX-5536M, REX-9836A
Note that the Adaptec 2920C is supported by the **ahc** driver.

Cards supported by the isp driver include:

ISP1000
PTI SBS440
ISP1020
ISP1040
PTI SBS450
Qlogic 1240
Qlogic 1020
Qlogic 1040
Qlogic 1080
Qlogic 1280
Qlogic 12160
Qlogic 2100
Qlogic 2102
Qlogic 2200
Qlogic 2202
Qlogic 2204
Qlogic 2300
Qlogic 2312
PTI SBS470
Antares P-0033

Controllers supported by the amd driver include:

MELCO IFC-DP (PC-98)

Tekram DC390
Tekram DC390T

Controllers supported by the nsp driver include:

Alpha-Data AD-PCS201
I-O DATA CBSC16
Adaptec AIC-7110 Parallel to SCSI interfaces (**vpo** driver)

The following controllers are supported by the ida driver:

Compaq SMART Array 221
Compaq Integrated SMART Array Controller
Compaq SMART Array 4200
Compaq SMART Array 4250ES
Compaq SMART 3200 Controller
Compaq SMART 3100ES Controller
Compaq SMART-2/DH Controller
Compaq SMART-2/SL Controller
Compaq SMART-2/P Controller
Compaq SMART-2/E Controller
Compaq SMART Controller

Controllers supported by the ciss driver include:

Compaq Smart Array 5300
Compaq Smart Array 532
Compaq Smart Array 5i
HP Smart Array 5312
HP Smart Array 6i
HP Smart Array 641
HP Smart Array 642
HP Smart Array 6400
HP Smart Array 6400 EM
HP Smart Array 6422
HP Smart Array V100
HP Modular Smart Array 20 (MSA20)
HP Modular Smart Array 500 (MSA500)

Controllers supported by the iir driver include:

Intel RAID Controller SRCMR
Intel Server RAID Controller U3-l (SRCU31a)
Intel Server RAID Controller U3-1L (SRCU31La)
Intel Server RAID Controller U3-2 (SRCU32)
All past and future releases of Intel and ICP RAID Controllers.
Intel RAID Controller SRCU21 (discontinued)
Intel RAID Controller SRCU31 (older revision, not compatible)
Intel RAID Controller SRCU31L (older revision, not compatible)
The SRCU31 and SRCU31L can be updated via a firmware update available from Intel.
Promise SuperTrak ATA RAID controllers (pst driver)

The hptmv driver supports the HighPoint RocketRAID 182x SATA controllers.

Controllers supported by the ips driver include:

IBM ServeRAID 3H
ServeRAID 4L/4M/4H
ServeRAID Series 5
ServeRAID 6i/6M

The following controllers are supported by the mpt driver:

LSI Logic 53c1030 (Dual Ultra320 SCSI)
LSI Logic FC909 (1Gb/s Fibre Channel)
LSI Logic FC909A (Dual 1Gb/s Fibre Channel)
LSI Logic FC919 (2Gb/s Fibre Channel)
LSI Logic FC929 (Dual 2Gb/s Fibre Channel)
The SCSI controller chips supprted by the **mpt** driver can be found onboard on many systems including:
Dell PowerEdge 1750
IBM eServer xSeries 335

SCSI controllers supported by the trm driver include:

Tekram DC-315 PCI Ultra SCSI adapter without BIOS and internal SCSI connector
Tekram DC-315U PCI Ultra SCSI adapter without BIOS
Tekram DC-395F PCI Ultra-Wide SCSI adapter with flash BIOS and 68-pin external SCSI connector
Tekram DC-395U PCI Ultra SCSI adapter with flash BIOS
Tekram DC-395UW PCI Ultra-Wide SCSI adapter with flash BIOS
Tekram DC-395U2W PCI Ultra2-Wide SCSI adapter with flash BIOS
For the Tekram DC-310/U and DC-390F/U/UW/U2B/U2W/U3W PCI SCSI host adapters, use the **sym** driver.

The wds driver supports the WD7000 SCSI controller.

7.5.2 Network Cards

R-Studio Agent Emergency is based on the **FreeBSD 5.3** kernel and supports devices from the list published at http://www.freebsd.org/releases/5.3R/hardware-i386.html.

*: Supported in the floppy version

Ethernet NICs

Adapters supported by the sf driver include:

ANA-62011 64-bit single port 10/100baseTX adapter
ANA-62022 64-bit dual port 10/100baseTX adapter
ANA-62044 64-bit quad port 10/100baseTX adapter
ANA-69011 32-bit single port 10/100baseTX adapter
ANA-62020 64-bit single port 100baseFX adapter

The ti driver supports Gigabit Ethernet adapters based on the Alteon Tigon I and II chips. The ti driver has been tested with the following adapters:

3Com 3c985-SX Gigabit Ethernet adapter (Tigon 1)
3Com 3c985B-SX Gigabit Ethernet adapter (Tigon 2)
Alteon AceNIC V Gigabit Ethernet adapter (1000baseSX)
Alteon AceNIC V Gigabit Ethernet adapter (1000baseT)
Digital EtherWORKS 1000SX PCI Gigabit adapter

Netgear GA620 Gigabit Ethernet adapter (1000baseSX)
Netgear GA620T Gigabit Ethernet adapter (1000baseT)

The following adapters should also be supported but have not yet been tested:

Asante GigaNIX1000T Gigabit Ethernet adapter
Asante PCI 1000BASE-SX Gigabit Ethernet adapter
Farallon PN9000SX Gigabit Ethernet adapter
NEC Gigabit Ethernet
Silicon Graphics PCI Gigabit Ethernet adapter

The pcn driver supports adapters and embedded controllers based on the AMD PCnet/FAST, PCnet/FAST+, PCnet/FAST III, PCnet/PRO and PCnet/Home Fast Ethernet chips:

AMD Am53C974/Am79C970/Am79C974 PCnet-PCI *
AMD Am79C970A PCnet-PCI II *
AMD Am79C971 PCnet-FAST *
AMD Am79C972 PCnet-FAST+ *
AMD Am79C973/Am79C975 PCnet-FAST III *
AMD Am79C976 PCnet-PRO *
AMD PCnet/Home HomePNA
Allied-Telesis LA-PCI
Contec C-NET(98)S (PC-98)
NEC SV-98/2-B05, B06

The lnc driver supports the following adapters:

Novell NE2100 *
Novell NE32-VL *
Isolan AT 4141-0 (16 bit)
Isolan BICC
Isolink 4110 (8 bit)
Diamond HomeFree
Digital DEPCA
Hewlett Packard Vectra 486/66XM
Hewlett Packard Vectra XU
Also supported are adapters working with the **pcn** driver. The **lnc** driver runs these in compatibility mode, thus the **pcn** driver should be preferred.
SMC 83c17x (EPIC)-based Ethernet NICs (**tx** driver)

The ed driver supports the following Ethernet NICs:

3Com 3c503 Etherlink II
AR-P500 Ethernet
Accton EN1644 (old model), EN1646 (old model), EN2203 (old model) (110pin) (flags 0xd00000)
Accton EN2212/EN2216/UE2216
Allied Telesis CentreCOM LA100-PCM_V2
Allied Telesis LA-98 (flags 0x000000) (PC-98)
Allied Telesis SIC-98, SIC-98NOTE (110pin), SIU-98 (flags 0x600000) (PC-98)
Allied Telesis SIU-98-D (flags 0x610000) (PC-98)
AmbiCom 10BaseT card
Bay Networks NETGEAR FA410TXC Fast Ethernet

CNet BC40 adapter
Compex Net-A adapter
Contec C-NET(98), RT-1007(98), C-NET(9N) (110pin) (flags 0xa00000) (PC-98)
Contec C-NET(98)E-A, C-NET(98)L-A, C-NET(98)P (flags 0x300000) (PC-98)
Corega Ether98-T (flags 0x000000) (PC-98)
Corega Ether PCC-T/EtherII PCC-T/FEther PCC-TXF/PCC-TXD
CyQ've ELA-010
DEC EtherWorks DE305
Danpex EN-6200P2
D-Link DE-298, DE-298P (flags 0x500000) (PC-98)
D-Link DE-650/660
D-Link IC-CARD/IC-CARD+ Ethernet
ELECOM LD-98P (flags 0x500000) (PC-98)
ELECOM LD-BDN, LD-NW801G (flags 0x200000) (PC-98)
ELECOM Laneed LD-CDL/TX, LD-CDF, LD-CDS, LD-10/100CD, LD-CDWA (DP83902A)
HP PC Lan+ 27247B and 27252A
IBM Creditcard Ethernet I/II
ICM AD-ET2-T, DT-ET-25, DT-ET-T5, IF-2766ET, IF-2771ET, NB-ET-T (110pin) (flags 0x500000) (PC-98)
I-O DATA LA/T-98, LA/T-98SB, LA2/T-98, ET/T-98 (flags 0x900000) (PC-98)
I-O DATA ET2/T-PCI
I-O DATA PCLATE
Kansai KLA-98C/T (flags 0x900000) (PC-98)
Kingston KNE-PC2, KNE-PCM/x Ethernet
Linksys EC2T/PCMPC100/PCM100, PCMLM56
Linksys EtherFast 10/100 PC Card, Combo PCMCIA Ethernet Card (PCMPC100 V2)
Logitec LAN-98T (flags 0xb00000) (PC-98)
MACNICA Ethernet ME1 for JEIDA
MACNICA ME98 (flags 0x900000) (PC-98)
MACNICA NE2098 (flags 0x400000) (PC-98)
MELCO EGY-98 (flags 0x300000) (PC-98)
MELCO LGH-98, LGY-98, LGY-98-N (110pin), IND-SP, IND-SS (flags 0x400000) (PC-98)
MELCO LGY-PCI-TR
MELCO LPC-T/LPC2-T/LPC2-CLT/LPC2-TX/LPC3-TX/LPC3-CLX
NDC Ethernet Instant-Link
NEC PC-9801-77, PC-9801-78 (flags 0x910000) (PC-98)
NEC PC-9801-107, PC-9801-108 (flags 0x800000) (PC-98)
National Semiconductor InfoMover NE4100
NetGear FA-410TX
NetVin 5000
Network Everywhere Ethernet 10BaseT PC Card
Networld 98X3 (flags 0xd00000) (PC-98)
Networld EC-98X, EP-98X (flags 0xd10000) (PC-98)
Novell NE1000/NE2000/NE2100
PLANEX ENW-8300-T

PLANEX EN-2298-C (flags 0x200000) (PC-98)
PLANEX EN-2298P-T, EN-2298-T (flags 0x500000) (PC-98)
PLANEX FNW-3600-T
RealTek 8029
SMC Elite 16 WD8013
SMC Elite Ultra
SMC EtherEZ98 (flags 0x000000) (PC-98)
SMC WD8003E/WD8003EBT/WD8003S/WD8003SBT/WD8003W/WD8013EBT/WD8013W and clones
Socket LP-E
Surecom EtherPerfect EP-427
Surecom NE-34
TDK LAK-CD031, Grey Cell GCS2000 Ethernet Card
Telecom Device SuperSocket RE450T
VIA VT86C926
Winbond W89C940
C-Bus, ISA, PCI and PC Card devices are supported.

Adapters supported by the rl driver include:

Accton ``Cheetah'' EN1207D (MPX 5030/5038; RealTek 8139 clone)
Allied Telesyn AT2550
Allied Telesyn AT2500TX
Belkin F5D5000
BUFFALO(Melco INC.) LPC-CB-CLX(CardBus)
Compaq HNE-300
CompUSA no-name 10/100 PCI Ethernet NIC
Corega FEther CB-TXD
Corega FEtherII CB-TXD
D-Link DFE-530TX+
D-Link DFE-538TX (same as 530+?)
D-Link DFE-690TXD
Edimax EP-4103DL CardBus
Encore ENL832-TX 10/100 M PCI
Farallon NetLINE 10/100 PCI
Genius GF100TXR,
GigaFast Ethernet EE100-AXP
KTX-9130TX 10/100 Fast Ethernet
LevelOne FPC-0106TX
Longshine LCS-8038TX-R
NDC Communications NE100TX-E
Netronix Inc. EA-1210 NetEther 10/100
Nortel Networks 10/100BaseTX
OvisLink LEF-8129TX
OvisLink LEF-8139TX
Peppercon AG ROL-F
Planex FNW-3800-TX

SMC EZ Card 10/100 PCI 1211-TX
SOHO(PRAGMATIC) UE-1211C

The wb driver supports Winbond W89C840F based Fast Ethernet adapters and embedded controllers including:

Trendware TE100-PCIE *

The vr driver supports VIA Technologies Rhine I, Rhine II, and Rhine III based Fast Ethernet adapters including:

D-Link DFE530-TX
Hawking Technologies PN102TX
AOpen/Acer ALN-320

The sis driver supports Silicon Integrated Systems SiS 900 * and SiS 7016 * based Fast Ethernet adapters and embedded controllers, as well as Fast Ethernet adapters based on the National Semiconductor DP83815 (MacPhyter) chip. Supported adapters include:

@Nifty FNECHARD IFC USUP-TX
MELCO LGY-PCI-TXC
Netgear FA311-TX (DP83815)
Netgear FA312-TX (DP83815)
SiS 630, 635, and 735 motherboard chipsets

The nge driver supports National Semiconductor DP83820 * and DP83821 based Gigabit Ethernet adapters including:

SMC EZ Card 1000 (SMC9462TX)
D-Link DGE-500T
Asante FriendlyNet GigaNIX 1000TA and 1000TPC
Addtron AEG320T
LinkSys EG1032 (32-bit PCI) and EG1064 (64-bit PCI)
Surecom Technology EP-320G-TX
Netgear GA622T
Netgear GA621
Ark PC SOHO-GA2500T (32-bit PCI) and SOHO-GA2000T (64-bit PCI)
Trendware TEG-PCITX (32-bit PCI) and TEG-PCITX2 (64-bit PCI)

The ste driver supports Sundance Technologies ST201 based Fast Ethernet adapters and embedded controllers including:

D-Link DFE-530TXS
D-Link DFE-550TX

Adapters supported by the sk driver include:

3COM 3C940 single port, 1000baseT adapter
Belkin F5D5005 single port, 1000baseT adapter
Linksys EG1032 single port, 1000baseT adapter
SK-9521 SK-NET GE-T single port, 1000baseT adapter
SK-9821 SK-NET GE-T single port, 1000baseT adapter *
SK-9822 SK-NET GE-T dual port, 1000baseT adapter *
SK-9841 SK-NET GE-LX single port, single mode fiber adapter *
SK-9842 SK-NET GE-LX dual port, single mode fiber adapter *
SK-9843 SK-NET GE-SX single port, multimode fiber adapter *
SK-9844 SK-NET GE-SX dual port, multimode fiber adapter *

SMC 9452TX single port, 1000baseT adapter

The tl driver supports Texas Instruments ThunderLAN based Ethernet and Fast Ethernet adapters including a large number of Compaq PCI Ethernet adapters. Also supported are:

Olicom OC-2135/2138 10/100 TX UTP adapter
Olicom OC-2325/OC-2326 10/100 TX UTP adapter
Racore 8148 10baseT/100baseTX/100baseFX adapter
Racore 8165 10/100baseTX adapter

The tl driver also supports the built-in Ethernet adapters of various Compaq Prosignia servers and Compaq Deskpro desktop machines including:

Compaq Netelligent 10
Compaq Netelligent 10 T PCI UTP/Coax
Compaq Netelligent 10/100
Compaq Netelligent 10/100 Dual-Port
Compaq Netelligent 10/100 Proliant
Compaq Netelligent 10/100 TX Embedded UTP
Compaq Netelligent 10/100 TX UTP
Compaq NetFlex 3P
Compaq NetFlex 3P Integrated
Compaq NetFlex 3P w/BNC

The dc driver provides support for the following chipsets: *

DEC/Intel 21143
ADMtek AL981 Comet, AN985 Centaur, ADM9511 Centaur II and ADM9513 Centaur II
ASIX Electronics AX88140A and AX88141
Conexant LANfinity RS7112 (miniPCI)
Davicom DM9009, DM9100, DM9102 and DM9102A
Lite-On 82c168 and 82c169 PNIC
Lite-On/Macronix 82c115 PNIC II
Macronix 98713, 98713A, 98715, 98715A, 98715AEC-C, 98725, 98727 and 98732
Xircom X3201 (cardbus only)

The following NICs are known to work with the dc driver at this time:

3Com OfficeConnect 10/100B (ADMtek AN985 Centaur-P)
Abocom FE2500
Accton EN1217 (98715A)
Accton EN2242 MiniPCI
Adico AE310TX (98715A)
Alfa Inc GFC2204 (ASIX AX88140A)
Built in 10Mbps only Ethernet on Compaq Presario 7900 series desktops (21143, non-MII)
Built in DE500-BA on DEC Alpha workstations (21143, non-MII)
Built in Sun DMFE 10/100 Mbps Ethernet on Sun Netra X1 and Sun Fire V100 (DM9102A, MII)
Built in Ethernet on LinkSys EtherFast 10/100 Instant GigaDrive (DM9102, MII)
CNet Pro110B (ASIX AX88140A)
CNet Pro120A (98715A or 98713A) and CNet Pro120B (98715)
Compex RL100-TX (98713 or 98713A)
D-Link DFE-570TX (21143, MII, quad port)
Digital DE500-BA 10/100 (21143, non-MII)

ELECOM Laneed LD-CBL/TXA (ADMtek AN985)
Hawking CB102 CardBus
IBM EtherJet Cardbus Adapter
Intel PRO/100 Mobile Cardbus (versions that use the X3201 chipset)
Jaton XpressNet (Davicom DM9102)
Kingston KNE100TX (21143, MII)
Kingston KNE110TX (PNIC 82c169)
LinkSys LNE100TX (PNIC 82c168, 82c169)
LinkSys LNE100TX v2.0 (PNIC II 82c115)
LinkSys LNE100TX v4.0/4.1 (ADMtek AN985 Centaur-P)
Matrox FastNIC 10/100 (PNIC 82c168, 82c169)
Melco LGY-PCI-TXL
Microsoft MN-120 10/100 CardBus (ADMTek Centaur-C)
Microsoft MN-130 10/100 PCI (ADMTek Centaur-P)
NDC SOHOware SFA110A (98713A)
NDC SOHOware SFA110A Rev B4 (98715AEC-C)
NetGear FA310-TX Rev. D1, D2 or D3 (PNIC 82c169)
Netgear FA511
PlaneX FNW-3602-T (ADMtek AN985)
SMC EZ Card 10/100 1233A-TX (ADMtek AN985)
SVEC PN102-TX (98713)
Xircom Cardbus Realport
Xircom Cardbus Ethernet 10/100
Xircom Cardbus Ethernet II 10/100

Adapters supported by the aue driver include:

Abocom UFE1000, DSB650TX_NA
Accton USB320-EC, SpeedStream
ADMtek AN986, AN8511
Billionton USB100, USB100LP, USB100EL, USBE100
Corega Ether FEther USB-T, FEther USB-TX, FEther USB-TXS
D-Link DSB-650, DSB-650TX, DSB-650TX-PNA
Elecom LD-USBL/TX
Elsa Microlink USB2Ethernet
HP hn210e
I-O Data USB ETTX
Kingston KNU101TX
LinkSys USB10T adapters that contain the AN986 Pegasus chipset, USB10TA, USB10TX, USB100TX, USB100H1
MELCO LUA-TX, LUA2-TX
Planex UE-200TX
Sandberg USB to Network Link (model number 133-06)
Siemens Speedstream
SmartBridges smartNIC
SMC 2202USB
SOHOware NUB100

The cue driver supports CATC USB-EL1210A based USB Ethernet adapters including:

Belkin F5U011/F5U111
CATC Netmate
CATC Netmate II
SmartBridges SmartLink

The kue driver supports Kawasaki LSI KL5KLUSB101B based USB Ethernet adapters including:

3Com 3c19250
3Com 3c460 HomeConnect Ethernet USB Adapter
ADS Technologies USB-10BT
AOX USB101
ATen UC10T
Abocom URE 450
Corega USB-T
D-Link DSB-650C
Entrega NET-USB-E45, NET-HUB-3U1E
I/O Data USB ETT
Kawasaki DU-H3E
LinkSys USB10T
Netgear EA101
Peracom USB Ethernet Adapter
SMC 2102USB, 2104USB

The axe driver supports ASIX Electronics AX88172 based USB Ethernet adapters including:

Buffalo (Melco Inc.) LUA-U2-KTX
D-Link DUBE100
LinkSys USB200M
Netgear FA120
System TALKS Inc. SGC-X2UL

The rue driver supports RealTek RTL8150 based USB Ethernet adapters including:

Buffalo (Melco Inc.) LUA-KTX
Green House GH-USB100B
LinkSys USB100M
Billionton 10/100 FastEthernet USBKR2

The udav driver supports the following adapters:

Corega FEther USB-TXC

Adapters supported by the de driver include:

Adaptec ANA-6944/TX
Cogent EM100FX and EM440TX
Corega FastEther PCI-TX
D-Link DFE-500TX
DEC DE435, DE425, DEC DE450, and DEC DE500
ELECOM LD-PCI2T, LD-PCITS
I-O DATA LA2/T-PCI
SMC Etherpower 8432, 9332 and 9334
ZNYX ZX3xx

Controllers and cards supported by the fe driver include:

Allied Telesis RE1000, RE1000Plus, ME1500 (110-pin)
CONTEC C-NET(98)P2, C-NET (9N)E (110-pin), C-NET(9N)C (ExtCard)
CONTEC C-NET(PC)C PCMCIA Ethernet
Eiger Labs EPX-10BT
Fujitsu FMV-J182, FMV-J182A
Fujitsu MB86960A, MB86965A
Fujitsu MBH10303, MBH10302 Ethernet PCMCIA
Fujitsu Towa LA501 Ethernet
HITACHI HT-4840-11
NextCom J Link NC5310
RATOC REX-5588, REX-9822, REX-4886, and REX-R280
RATOC REX-9880/9881/9882/9883
TDK LAC-98012, LAC-98013, LAC-98025, LAC-9N011 (110-pin)
TDK LAK-CD021, LAK-CD021A, LAK-CD021BX
Ungermann-Bass Access/PC N98C+(PC85152, PC85142), Access/NOTE N98(PC86132) (110-pin)

Adapters supported by the fxp driver include:

Intel EtherExpress PRO/10
Intel InBusiness 10/100
Intel PRO/100B / EtherExpressPRO/100 B PCI Adapter *
Intel PRO/100+ Management Adapter
Intel PRO/100 VE Desktop Adapter
Intel PRO/100 M Desktop Adapter
Intel PRO/100 S Desktop, Server and Dual-Port Server Adapters
Contec C-NET(PI)-100TX (PC-98)
NEC PC-9821Ra20, Rv20, Xv13, Xv20 internal 100Base-TX (PC-98)
NEC PC-9821X-B06 (PC-98)
Many on-board network interfaces on Intel motherboards

The ex driver supports the following Ethernet adapters:

Intel EtherExpress Pro/10
Intel EtherExpress Pro/10+
The Olicom OC2220

The ie driver provides supports the following 8 and 16bit ISA Ethernet cards that are based on the Intel i82586 chip:

3COM 3C507
AT&T EN100
AT&T Starlan 10
AT&T Starlan Fiber
Intel EtherExpress 16
RACAL Interlan NI5210

The ep driver supports Ethernet adapters based on the 3Com 3C5x9 Etherlink III Parallel Tasking chipset, including:

3Com 3C1 CF
3Com 3C509-TP, 3C509-BNC, 3C509-Combo, 3C509-TPO, 3C509-TPC ISA

3Com 3C509B-TP, 3C509B-BNC, 3C509B-Combo, 3C509B-TPO, 3C509B-TPC ISA
3Com 3C529, 3C529-TP MCA
3Com 3C562/3C563 PCMCIA
3Com 3C569B-J-TPO, 3C569B-J-COMBO CBUS
3Com 3C574-TX, 3CCFE574BT, 3CXFE574BT, 3C3FE574BT PCMCIA
3Com 3C579-TP, 3C579-BNC EISA
3Com 3C589, 3C589B, 3C589C, 3C589D, 3CXE589DT PCMCIA
3Com 3CCFEM556B, 3CCFEM556BI PCMCIA
3Com 3CXE589EC, 3CCE589EC, 3CXE589ET, 3CCE589ET PCMCIA
3Com Megahertz 3CCEM556, 3CXEM556, 3CCEM556B, 3CXEM556B PCMCIA
3Com OfficeConnect 3CXSH572BT, 3CCSH572BT PCMCIA
Farallon EtherMac PCMCIA

The el driver supports the 3Com 3c501 8bit ISA Ethernet card.

The xl driver supports the following hardware:

3Com 3c900-TPO *
3Com 3c900-COMBO *
3Com 3c905-TX *
3Com 3c905-T4 *
3Com 3c900B-TPO *
3Com 3c900B-TPC *
3Com 3c900B-FL *
3Com 3c900B-COMBO *
3Com 3c905B-T4 *
3Com 3c905B-TX *
3Com 3c905B-FX *
3Com 3c905B-COMBO *
3Com 3c905C-TX *
3Com 3c980, 3c980B, and 3c980C server adapters
3Com 3cSOHO100-TX OfficeConnect adapters
3Com 3c450 HomeConnect adapters
3Com 3c555, 3c556 and 3c556B mini-PCI adapters
3Com 3C3SH573BT, 3C575TX, 3CCFE575BT, 3CXFE575BT, 3CCFE575CT, 3CXFE575CT, 3CCFEM656, 3CCFEM656B, and 3CCFEM656C, 3CXFEM656, 3CXFEM656B, and 3CXFEM656C CardBus adapters
3Com 3c905-TX, 3c905B-TX 3c905C-TX, and 3c920B-EMB embedded adapters
Both the 3C656 family of CardBus cards and the 3C556 family of MiniPCI cards have a built-in proprietary modem. Neither the xl driver nor any other driver supports this modem.

The vx driver supports the following cards:

3Com 3c590 EtherLink III PCI *
3Com 3c592 EtherLink III EISA
3Com 3c595 Fast EtherLink III PCI in 10 Mbps mode *
3Com 3c597 Fast EtherLink III EISA in 10 Mbps mode
Crystal Semiconductor CS89x0-based NICs (**cs** driver)

The sn driver supports SMC9xxx based ISA and PCMCIA cards including:

3Com Megahertz X-Jack Ethernet PC-Card CC-10BT

The xe driver supports the following cards:

Xircom CreditCard Ethernet (PS-CE2-10)
Xircom CreditCard Ethernet + Modem 28 (PS-CEM-28)
Xircom CreditCard Ethernet + Modem 33 (CEM33)
Xircom CreditCard 10/100 (CE3, CE3B)
Xircom CreditCard Ethernet 10/100 + Modem 56 (CEM56)
Xircom RealPort Ethernet 10 (RE10)
Xircom RealPort Ethernet 10/100 (RE100)
Xircom RealPort Ethernet 10/100 + Modem 56 (REM56, REM56G)
Accton Fast EtherCard-16 (EN2226)
Compaq Netelligent 10/100 PC Card (CPQ-10/100)
Intel EtherExpress Pro/100 PC Card Mobile Adapter 16 (Pro/100 M16A)
Other similar devices using the same hardware may also be supported.

Adapters supported by the lge driver include:

SMC TigerCard 1000 (SMC9462SX) *
D-Link DGE-500SX *

The txp driver supports the following cards:

3Com 3CR990-TX-95 *
3Com 3CR990-TX-97 *
3Com 3cR990B-TXM *
3Com 3CR990SVR95 *
3Com 3CR990SVR97 *
3Com 3cR990B-SRV *

The bge driver provides support for various NICs based on the Broadcom BCM570x family of Gigabit Ethernet controller chips, including the following:

3Com 3c996-T (10/100/1000baseTX) *
Dell PowerEdge 1750 integrated BCM5704C NIC (10/100/1000baseTX) *
Dell PowerEdge 2550 integrated BCM5700 NIC (10/100/1000baseTX) *
Dell PowerEdge 2650 integrated BCM5703 NIC (10/100/1000baseTX) *
IBM x235 server integrated BCM5703x NIC (10/100/1000baseTX) *
HP ProLiant NC7760 embedded Gigabit NIC (10/100/1000baseTX) *
HP ProLiant NC7770 PCI-X Gigabit NIC (10/100/1000baseTX) *
HP ProLiant NC7781 embedded PCI-X Gigabit NIC (10/100/1000baseTX) *
Netgear GA302T (10/100/1000baseTX) *
SysKonnect SK-9D21 (10/100/1000baseTX) *
SysKonnect SK-9D41 (1000baseSX) *

The em driver supports Gigabit Ethernet adapters based on the Intel 82540, 82541PI, 82542, 82543, 82544, 82546, 82546EB and 82547 controller chips:

Intel PRO/1000 CT Network Connection (82547)
Intel PRO/1000 F Server Adapter (82543)
Intel PRO/1000 Gigabit Server Adapter (82542)*
Intel PRO/1000 GT Desktop Adapter (82541PI)

Intel PRO/1000 MF Dual Port Server Adapter (82546)
Intel PRO/1000 MF Server Adapter (82545)
Intel PRO/1000 MF Server Adapter (LX) (82545)
Intel PRO/1000 MT Desktop Adapter (82540)
Intel PRO/1000 MT Desktop Adapter (82541)
Intel PRO/1000 MT Dual Port Server Adapter (82546)
Intel PRO/1000 MT Quad Port Server Adapter (82546EB)
Intel PRO/1000 MT Server Adapter (82545)
Intel PRO/1000 T Desktop Adapter (82544)
Intel PRO/1000 T Server Adapter (82543)
Intel PRO/1000 XF Server Adapter (82544)
Intel PRO/1000 XT Server Adapter (82544)

The gx driver supports Gigabit Ethernet adapters based on the Intel 82542 and 82543 controller chips:

Intel PRO/1000 Gigabit Server Adapter (82542)
Intel PRO/1000 F Server Adapter (82543)
Intel PRO/1000 T Server Adapter (82543)

The hme driver supports the on-board Ethernet interfaces of many Sun UltraSPARC workstation and server models. Cards supported by the hme driver include:

Sun PCI SunSwift Adapter
Sun SBus SunSwift Adapter ``( hme" and ``SUNW,hme")
Sun PCI Sun100BaseT Adapter 2.0
Sun SBus Sun100BaseT 2.0
Sun PCI Quad FastEthernet Controller
Sun SBus Quad FastEthernet Controller

The my driver provides support for various NICs based on the Myson chipset. Supported models include:

Myson MTD800 PCI Fast Ethernet chip
Myson MTD803 PCI Fast Ethernet chip
Myson MTD89X PCI Gigabit Ethernet chip

Broadcom BCM4401 based Fast Ethernet adapters (bfe driver) *

The re driver supports RealTek RTL8139C+, RTL8169, RTL8169S and RTL8110S based Fast Ethernet and Gigabit Ethernet adapters including:

Alloy Computer Products EtherGOLD 1439E 10/100 (8139C+) *
Compaq Evo N1015v Integrated Ethernet (8139C+) *
Corega CG-LAPCIGT Gigabit Ethernet (8169S) *
Gigabyte 7N400 Pro2 Integrated Gigabit Ethernet (8110S) *
PLANEX COMMUNICATIONS Inc. GN-1200TC (8169S) *
Xterasys XN-152 10/100/1000 NIC (8169) *

The ixgb driver supports the following cards:

Intel PRO/10GbE LR Server Adapter *
Intel PRO/10GbE SR Server Adapter *

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